

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

JAN. 19, 1953

50 CENTS

Quality by BG

Proof of the superior quality of BG Aircraft Spark Plugs is their use wherever quality products are a must. Choice of leading airlines the world over, BG Aircraft Spark Plugs are symbolic of 35 years of specialized experience in the design and manufacture of aviation products.



For information on this and other BG products write to

THE **BG** CORPORATION

136 West 52nd Street
New York 19, N.Y.



The Grumman F-6 COUGAR is the Navy's latest addition to its carrier-based combat force. Rated for security reasons is the "over 600 MPH" class, the swept wing COUGAR is the successor to the battle-proven Grumman FANTHOM.

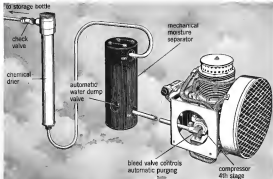
The complex turbine control needed to regulate the COUGAR's powerful Pratt and Whitney J-43 jet engine is designed, engineered and manufactured by Holley.



LEADER IN THE DESIGN,
DEVELOPMENT, AND
MANUFACTURE OF AVIATION
FUEL INJECTION DEVICES.

HOLLEY
Carburetor Co.

DETROIT 4, MICHIGAN



this KIDDE dehydration equipment makes pneumatics work at 50,000 feet

Aircraft pneumatics systems don't have to freeze—even at 50,000 feet.

Kidde dehydration equipment, through processes of separation and drying, delivers compressed air to the storage bottles with a free air dew point of at least minus 55° F. Saturated air going into the compressor is 99.4% dry when it reaches the storage bottles. The accumulated moisture is released by automatic dump valves. When this happens the entire system from compressor to check valve is purged.

This special Kidde dehydration equipment, coupled with the new lightweight Kidde four-stage compressor, gives you a "workhorse" pneumatics system even at altitudes of 50,000 feet and through a temperature range of minus 65° F to 160° F.

Write today for full information



Kidde

Walter Kidde & Company, Inc.

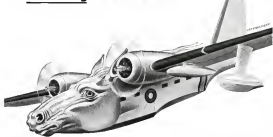
210 Main Street, Buffalo 6, N. Y.

Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.



The word "Kidde" and the Kidde seal are trademarks of Walter Kidde & Company, Inc. and its direct subsidiaries.

"Air horses" for lifesaving over the sea



Powered to win any race with disaster, a sturdy reliable for every mission over inclement waters—the 1400-hp engine for air sea rescues is a marvel of modern precision engineering. To help meet volume production of this Waghli Cyclone engine, Lycoming and the U. S. Air Force rely on the skill and resources of Lycoming. Lycoming stands ready to assist you—whether you have "just an idea" that needs development, a problem in the blueprint stage, or a finished product that needs speed, precise fabrication. Long hours in the metal working field, Lycoming continues to meet the most exacting and diverse requirements, both industrial and military. Whatever your problem—look to Lycoming!

Lycoming's wealth of creative engineering ability, its 20 million sq ft floor space, its more than 6,000 machine tools stand ready to serve your needs.

AIR GROUP DIVISION FOR AIRCRAFT AND AIRCRAFT USE • PRECISION AND VOLUME ENGINE PARTS • 24-HR. SERVICE • 1000 PLANT LOCATIONS

LOOK TO **LYCOMING** FOR RESEARCH AND PRECISION PRODUCTION

LYCOMING ENGINE DIVISION
WILMINGTON, DELAWARE
WILMINGTON, DELAWARE
WILMINGTON, DELAWARE

To power a plane with dependable "horses"—mighty engines for hazardous air-sea rescue work—the Air Force looks to Lycoming for precision production.



Bridgeport Lycoming Division
APCO Manufacturing Corp.

Westfield, Ohio
(There are no further applications for Lycoming's special abilities and facilities.)

Name _____ Title _____
Firm _____ Address _____
City _____ State _____ Zip _____

Domestic

Chrysler Corp. has been awarded a \$10-million dollar contract for research and development on an Army Chinook helicopter. The work will be handled in a position of the 2nd unit of the Navy's chief engine plant just outside Detroit. George J. Hootman, Jr., Chrysler chief engine research, will be executive engineer of the project.

Cessna YB-63 night jet bomber made its first reconnaissance flight from Ft. Worth, Tex., to Edwards AFB, Calif., on a solo mission. The aircraft, on a solo mission, will be used for reconnaissance and engine thrust tests of the engine.

Allen E. Pickett, head of the aerodynamics section, Hughes Aircraft Co., Culver City, Calif., has been appointed to the Research & Development Board's committee on general matters.

Personnel and executive plane shipments by air companies during November totaled 212, 240-to-the-plane flight valued at \$1,500,000. There were 199 first or more plane flights and 73 one and two planes.

Navy has ordered additional, order-confirmed members of the F3H-100, a Douglas A-100, McDonnell Aircraft Corp., St. Louis, Mo.

Damage will occurring in the flight of the Eastern Air Line DC-4 and a Boeing P-51 fighter at Washington National Airport Nov. 1, 1961, has been ruled by the U. S. District Court, Washington, D. C. Between \$10 million and \$15 million in claims may be involved.

Leslie O. Baines has resigned as director of operations for ATA and executive director of National Air Transport Coordinating Committee to become director of operations for Allegheny Airlines. He succeeds Colin McIntosh who resigned as vice president and director of the airline last summer.

San Diego city officials have been asked to refuse permits for construction of multiple-story buildings on an industrial area adjoining Miramar Naval Air Station, which is being developed into a large jet plane base and has a similar aircraft carrier dock space (and other aircraft).

Don Flowers, former Cessna Aircraft Co. sales manager, has become a partner in the new firm of Colbreth & Flowers,



CHARLES F. WILLIS, JR., right, confers with William Mosses, Jr. on the part as president of White-Rose Corp., which was active from September 1971 in the China for Bismarck campaign.

William Mosses, Jr., president of White-Rose Corp., which was active from September 1971 in the China for Bismarck campaign.

Flight Tiger Line four-engine jet (part involved in a November 15 crash at Seattle, Wash., Jan. 7, killing all seven passengers and crew members).

Raymond A. Young, former head of rotor design for Boeing's Research Division, has been appointed chief engineer for Helicopters, Palo Alto, Calif.

Wentworth AFB is now named for former Cessna AFB, Mo. Station was renamed in honor of Maj. Gen. Paul B. Wentworth, World War II commander of the 11th Air Force, killed in a B-25 crash in North Carolina in 1945.

William W. Sander, flight test pilot with Chance Vought Aircraft Division, was killed in a crash of his F3U-1 Corsair while making a low-level approach at Bradley Field, Tex.

Gladys S. Downs, president of Donnell Helicopters, Inc., Danbury, Conn., has been appointed a member of 1971 of the NACA Subcommittee on Helicopters.

Richard N. Gove, 50, died of a heart attack in Washington, D. C., Jan. 7. During World War II he served in public relations representative and liaison officer in Washington, D. C., for Curtiss-Wright Corp. At the time of his death he was public relations field representative for the American Tanking Assn.

Financial

W. L. Mosses, Jr., New York City, president of White-Rose Corp., which was active from September 1971 in the China for Bismarck campaign, reports sales of \$15,525,388 for the fiscal year ended Sept. 30, with net income being \$525,494. This compares with the previous fiscal year's sales of \$7,451,985. Earnings at Dec. 15 totaled more than \$40 million compared with \$30 million a year earlier.

Len, Inc., Grand Rapids, Mich., reports net earnings for 1972 of \$45,550,000, compared with \$45,550,000 in 1971. Shipments for each month in the last quarter of 1972 were more than 54 million.

Intestate Engineering Corp., El Segundo, Calif., has declared a 10-cent dividend payable Jan. 31 to shareholders as of record on Jan. 15.

International

People do Brazil has purchased four DC-3s from the U. S. for transport with delivery starting next year and has taken option on two Cessna Series 500s. Order makes 46 Cessnas definitely sold and more than 100 more under discussion, every in advanced stages of negotiation, says Carlos de Oliveira, Cessna Co., Ltd.

Hawthorn & General Aircraft's four-engine fighter has been awarded the American Civil version of the plane is known as the Universal.

AVIATION CALENDAR

- Jan. 19-21-Pilot Maintenance Conference, Public Auditorium, Cleveland, O.
 Jan. 19-21-Winter general meeting of the American Institute of Electrical Engineers, Hotel Statler, New York, N. Y.
 Jan. 20-National Fire Protection Association Committee on Aviation and Airport Fire Protection, Hotel Statler, New York, N. Y.
 Jan. 15-29-31st Annual Meeting of Institute of Aeronautical Sciences, Hotel Statler, N. Y. House Night dinner Jan. 18.
 Feb. 10-Second session on industrial relations regarding American Society of Aeronautical Engineers, Bellevue-Stratford Hotel, Philadelphia.
 Feb. 12-13-National Aeronautics Education Council annual meeting, Atlantic City, N. J.
 Feb. 16-New York Section of the Instrument Society of America, Hotel Statler, New York, N. Y.
 Feb. 18-19-English Annual Conference of the Society of Aeronautical Engineers, Room 1000, Plaza Hotel, New York, N. Y.
 Feb. 22-24-General Annual Agreement Aviation Conference, Texas A & M College, College Station, Tex.
 Mar. 16-18-40th Annual Conference, Society of the Plastics Industry, Grand, Canal Hotel, New York, N. Y.
 Mar. 17-18-38th Annual Meeting American Society of Tool Engineers, Hotel Statler, Detroit.
 Mar. 21-26-Congress of Civil Aeronautics Engineers, Municipal Auditorium, Kansas City, Mo.
 Mar. 23-27-English Winter Metal Engineers and Congress, Fox Pavilion, London, England.
 Mar. 23-27-Third Milwaukee Conference on Fuel Mechanics, University of Wisconsin, Milwaukee.
 Mar. 27-29-National Production Forum of the SAE, Hotel Statler, Cleveland, O.
 Mar. 31-Apr. 2-Four International Marine Engineers Exposition, Hotel Statler, New York, N. Y.
 Apr. 6-10-Second Annual International Motor Sports Show, Grand Central Palace, New York, N. Y.
 Apr. 28-29-Aeromarine Production Forum, National Aeronautics Meeting and Aircraft Engineering, Dayton, Ohio.
 May 11-15-1951 SNAE National Conference on Aeronautics Engineering, Dayton, Ohio.
 May 16-18-1951 SNAE National Conference on Aeronautics Engineering, Dayton, Ohio.
 May 18-20-1951 SNAE National Conference on Aeronautics Engineering, Dayton, Ohio.
 May 21-23-1951 SNAE National Conference on Aeronautics Engineering, Dayton, Ohio.
 May 24-26-1951 SNAE National Conference on Aeronautics Engineering, Dayton, Ohio.
 May 29-31-1951 SNAE National Conference on Aeronautics Engineering, Dayton, Ohio.

THERE'S A BIG DIFFERENCE



...in Clamps, too!

Precision is the big difference that makes Monogram 3-11 Clamps so superior in the fabrication of sheet metal riveted and welded sections of aircraft. They are precision-made to do a precision job and offer many big advantages:

- Needles always uniform.
- Needles maintain true alignment.
- Greater spring tension.
- One piece construction.
- Safe, will not fly apart.
- Sturdier, last longer.
- Proven in 12 years use.

Write today for catalog on the many types and sizes of Monogram 3-11 Clamps and applying tools.



MONOGRAM **MONOGRAM**
 MANUFACTURING COMPANY **3-11 SAFETY CLAMPS**
 5557 Regester Street, Culver City, California

Washington Roundup

Aircraft Money: What Future?

It appears as certain as anything else in politics that Congress will turn the \$71.9 billion outlay in new money to slash the \$78.6 billion expenditures proposed in the Truman budget for fiscal 1954.

Aircraft funds probably will be given preferential treatment. But they aren't likely to come out unscathed.

The political situation makes a deep cut into expenditures virtually inevitable.

A body controlled situation in November 1954 is in prospect. Control of Congress is at stake. Republicans have a margin of 33 in the House, one in the Senate.

If Republicans are to go to the voters in next November elections with a balanced budget and tax reduction on the books, it will require a slash of at least \$10 billion in the Truman expenditure figure size to match estimated revenue of \$68 billion.

The move to hold down the outlay of new money is being given second priority.

Sen. Truman's request for \$41 billion in new money for the services probably will be slipped a few billions.

The \$5.5 billion added for USAF and Navy aircraft and related procurement may come through intact but it is almost sure to face a tough, uphill fight.

Two plans are receiving serious attention.

• **Service request basis.** For the first time, the services (as well as other government agencies) will be called upon to justify support funds as well as new funds being requested. That will open the way for reductions.

At stake is about \$12 billion for aircraft and related procurement that will be accelerated at the start of the fiscal year, July 1.

• **Revolutions might involve contract cancellations.**

• **Cutting on spending.** This could hit the military aircraft program hard and mean a long stretch.

The effect would depend on the ending. Deliveries would have to be placed in a long-term program and the cutting.

Sen. Harry Byrd, who will be a key figure in congressional fiscal policy-making, commented: "We'll probably handle the expenditure problem with a cutting the first year, and then go into ... striking unneeded balances."

Logging Aircraft Spending

Logging expenditures for aircraft and related procurement will be scrutinized closely by the new Congress.

• A year ago, the services reported to Congress that expenditures would be \$11.5 billion for the current 1953 fiscal year. USAF and it would spend \$9 billion, Navy, \$2.5 billion. USAF projected it would have in three place dollars if making more demands on. Now was.

• But deliveries are so far behind that the services now estimate that only \$2.5 billion—\$6 billion less than the program called for a year ago—will be spent in fiscal 1953.

Defense Department budget officers count on appropriations for aircraft and related procurement being affected two years hence in expenditures. This is based on an average two-year lead time for planes. But the services are falling far behind.

• \$11.5 billion was appropriated for USAF and Navy for aircraft and related procurement in fiscal 1953, the first year of the Korean war. But two years later, in fiscal 1951, only \$7.5 billion is to be expended.

• \$16.2 billion was appropriated in fiscal 1952. But estimated expenditures for fiscal 1954 is only \$9 billion.

Members of Congress feel that a sizable amount of the money on hand for aircraft could be avoided—and not appropriated in later years when it will be spent. Their aim is to give Congress more control over spending, in well as appropriations. Matters leaders will fight this proposal, though. Once unneeded funds are revealed there always is the prospect that, never will be re-appropriated.

Symington's New Role

Former Secretary for Air Staff Symington is back in a key spot in the defense picture as a member of the Senate Armed Services Committee. Sen. Russell Long requested to take a place on the Finance Committee, opening the spot for Symington.

Three new Democrats will take place on the Senate Interstate and Foreign Commerce Committee, with candidates now committed include Sen. John F. Kennedy, Sen. Mike Mansfield and Sen. George S. Shultz.

None of the newcomers has been active in aviation. Pasture and Monahan last year voted to open the subsidy field to commercial all-light aircraft.

Monahan favored putting national can as a company normally profit and rate.

• **Rebate, however, supported the more modest National Postal Union rate.**

CAA: Big Reshuffle

Civil Aeronautics Administration faces the first sweeping reshuffle of its 34 years.

• **Senators have voted a resolution requiring a hearing of all jobs in the agency that do not have to be filled by Civil Service personnel.** Republicans can then put in bids.

• **Both chairman Spiller Bridges and chairman John T. Tamm of the Appropriations Committee expect to cut CAA appropriations sharply and substantially curtail the present Civil Service establishment.**

• **Reorganization of the Department of Commerce Commission to reorganize CAA and other agencies more efficiently probably will be only a first step.** There is strong support for Sen. Homer Ferguson's proposal to establish a committee to pick up where the Eisenhower group leaves off.

New Legislation

• **General International on agreements.** Sen. Pat McCarran wants all executive air agreements with foreign governments to expire in six months and all future agreements to be treated subject to Senate confirmation.

• **Are airlines?** The conference proposed the new Air Defense Department's request for authority to establish an air academy. This introduced bills providing for the academy in their home states: Michigan, Arizona, Texas, Georgia, California.

• **Anti-airline legislation.** Direct was signed with reduction of two employees, with setting out plan for reasonable profit as the "service" rate for domestic and international carriers—a provision opposed by Air Transport Assn. The difference: Key Sen. McNamara would restrict, already in mail carriers, Rep. John H. Rankin would include anti-airline legislation.

• **Government help.** Rep. Eugene Keogh wants the government to build airports on the way of or adjacent to government buildings for use by the public service and the armed services.

—Katherine Johnson

PICTURE CREDITS

7-White World; 12-News; 14-Japan; 15-Continental; 16-White World; 17-White World.



THIS YOKE... for jet engine condensate drainage is a result of Flexonics Engineering

Among the many complexed aircraft components fabricated by Flexonics Corporation is the condensate drainage yoke illustrated above. The purpose of the yoke is to drain condensed fuel that has condensed after a pass down the burner ports.

It's an intricate device, combining flexible stainless steel hose, seamless steel tubing and special connections. Flexonics engineering makes it possible to manufacture these yokes on a production basis to rigid specifications.

Other critical components manufactured by Flexonics Corporation include hose of all descriptions, bellows, oil and fuel lines, ducting and connectors of all types and many special assemblies. We would welcome the opportunity to discuss your requirements with you. For recommendations send us outline of your needs.

Flexonics Corporation AIRCRAFT DIVISION
1302 S. THIRD AVENUE • MAYWOOD, ILLINOIS
FORMERLY CHICAGO METAL HOSE CORPORATION

Flexonics Division
of American
Metal Hose
Company
1302 S. Third Avenue
Maywood, Illinois 60154



Manufacture of Condensate and Fuel Oil Drainage Yokes at a Yoke at
American Metal Hose Company, Inc. Division of American Metal
Hose Company, Inc. Division of American Metal Hose Company, Inc.
at Chicago, Illinois. Corporation of Chicago, Inc., Chicago, Illinois

WHO'S WHERE

In the Front Office

William R. Riven is new president of Oldford Aircraft Engine Service, a subsidiary of Tennessee Air Lines. Other officers named in the firm's board of directors included Harry M. Riven, vice president, Richard R. Riven, secretary, Francis Riven, treasurer, Hub Riven, assistant secretary, and L. C. Riven, plant manager.

Gene Bach has been appointed vice president in charge of engineering at Greco Corp., New York, a subsidiary of General Aviation Corp.

Changes

Edmond B. Pate has joined Air Associates, Winston, N. C., as factory manager of the South Products Division.

K. W. Conkle has been promoted to works manager of Aerocold Motors, Inc., Reynolds, N. C., a subsidiary of Ford Motor Aircraft Corp.

Chas. F. McKenna has been named superintendent of the Aeromedical Maintenance Division of F. P. Goodrich Co., Alamo, Ohio.

W. E. Bertram has been designated Northwest Airlines director of ground safety, a new position.

W. E. Van Allen has been appointed as director of engineering at the Kona Flight Aircraft Division, Willow Grove, Mich. He formerly was supervisor of master scheduling at Corvair, San Diego.

John C. Becker has been elected asset and corporate manager at Southwest Airlines Co., Dallas, Tex.

George E. Smith Jr. has been named works manager of Link Aviation, Inc., Englewood, N. Y.

Samuel H. Smith recently was named project engineer for helicopter research at General Aircraft Co., Wichita, Kan.

Samuel H. Smith recently was named assistant ground traffic manager for National Airlines, Inc.

Capt. J. C. Killebrew has been promoted to deputy plant manager of San Diego, Calif. He is now assistant ground manager of the Irish Airlines.

W. F. Clark, former USAF wing commander, is now assistant chief pilot of Bristol Airplane Co., Great Britain.

Donald E. Flinn has been appointed vice president of United Aircraft Products Division, Ohio.

Wesley K. Riven has joined International Civil Aviation Organization as director of the legal branch, Montreal.

William C. Riven has been designated executive engineer of Vapor Heating Corp., manufacturers of furnaces for military jet aircraft.

Honors and Elections

Reg. Gen. John P. Hendry, president of Tennessee Airline Management Corp., has been named by U. S. Junior Chamber of Commerce as one of the "10 outstanding young men in the United States."

INDUSTRY OBSERVER

► Watch for titanium to appear soon as experimental propeller material. Engineers at three leading propeller companies are working on titanium blade designs.

► Vietnam Sabre pilots in Korea were pleased to see North American Aviation engineers eliminate considerable weight and complexity from the F-4B by eliminating the semi-automatic leading edge wing slats and improving leading edge characteristics of the wing. First of the new wings has appeared in specially modified F-4Bs and will be standard on F-4Bs now beginning to roll off the North American production line.

► Army is interested in the development of new type cargo helicopters and has asked for special research and development funds in its 1974 budget to foster the project.

► Major obstacle to development of aluminum alloy for turbine engine hot section is the lack of a suitable strong-type orthode oxide tube. Engineers developing Aluminum Oxide tubes offer the only means of obtaining a sufficiently light weight alloy that will not oxidize at high temperatures. However, higher strength and RCA reportedly are not too interested in this application of their new alloy tube because of the priority of other applications.

► De Havilland Comet 4 may be the last of the Comet series. The plane now ordered to be the Comet 4 will incorporate such design changes from the present Comet Series that De Havilland probably will give it a new name. Although no firm design has yet been fixed for the Comet 4, a radically different wing plan for higher Mach numbers is in progress.

► Pratt & Whitney says the principle difficulties with the current version of the Variable Supersonic Shock wave wing flutter and control problems at high speeds.

► Anglo American conference on retrofitting of jet transporters is expected to begin in Washington early in February. Robert H. Hargrave, secretary of the British Air Registration Board, and his technical staff are scheduled to leave London late in January for conference with CAA Administrator Charles Hume and his technical staff, headed by George Holdren.

► USAF aspect of the supersonic propeller flight test program is indicated by the fact the turbo-propeller-powered Republic F-401 is not expected to take to the air until mid-1974. The F-401 will be powered by a Wright T34 turbo-prop turning an Aeroquip design of two three-bladed, semi-rigid, high-speed propellers mounted in tandem.

► Vickers order for replacing Vickers bombers will include some tanker versions for aerial refueling operations. British have developed new types of tanker bombers to fit the high altitude needs of its new line of jet bombers—Vickers, Vulcan and Victor.

► Aeroquip's answer to the Carter criterion method of testing propellers is expected to be a new Aeroquip machine to be installed at Wyandotte, Mich., Worcester, Mass. The Aeroquip machine is designed to consistently check tolerances that the American flying method previously used, but manufacturers say that Aeroquip will use a two-stage blade.

► Navy plans to copy a large number of its combat units with guided missiles during 1974. Standard carrier units will be the Spruance, Spruance, intended to go into volume production at a new plant located at Bristol, Texas. Charles W. Wadsworth also has a large Navy project under way for the Republic ground-to-ground missile. Republic is a subsonic aircraft type made powered by a turbojet, similar to the USAF Mustang built by the Glenn L. Martin Co.

AVIATION WEEK

Record Postwar Air Spending Predicted

VOL. 56, NO. 3

JANUARY 19, 1953

- Budget estimates a peak of \$21 billion in 1954.
- AF expected to complete bulk of 143 wings.

By Robert Hata

Federal spending on aviation is headed for a record postwar peak of \$21 billion during fiscal 1954, according to budget estimates submitted to Congress by President Truman.

The \$21 billion in aviation expenditures estimated for fiscal 1954 compares with the spending of an estimated \$19 billion for the current fiscal year ending June 30.

New funds requested for aviation in the Truman budget are about \$7 billion lower than last year's—\$22.7 billion in fiscal 1953 and \$18.7 billion for fiscal 1954. New obligations for aviation account for about 27% of the total \$72.9 billion federal budget requested for fiscal 1954. These budget requests face a tough fight in the Next Congress, where the Republicans eagerly sit back on watching an increase rise.

Biggest slice of aviation expenditures will now obligations pass to the Air Force, which accounts for 59% of the spending and 73% of the new obligations.

• **Procurement Package.** A total of slightly more than \$9 billion has been requested to buy 7,500 new aircraft and related equipment. USAF will get about \$190 of these planes, with the remainder divided among Navy, Marines and Army aviation.

During fiscal 1954, USAF and Navy together plan to spend 59 billion on aircraft procurement compared with an estimated \$7.6-billion expenditure in fiscal 1953. No figures are available on Army aviation spending for either fiscal 1953 or 1954.

With the fiscal 1954 aircraft procurement totals, the purchase of a total of 31,800 new military aircraft will have been provided for since the outbreak of war in Korea at the end of fiscal 1945.

The fiscal 1954 procurement budget will complete the bulk of USAF procurement for the 343-wing program, having surpassed requirements of obsolescence and attrition. It also will provide for replacement of 16 Navy Air group plus supporting units and three Marine air wings and greatly re-

Funds for Air Power

Money Requested

	1952 FISCAL (ACTUAL)	1953 FISCAL (ESTIMATED)	1954 FISCAL (ESTIMATED)
Air Force	\$22,876,061,377	\$22,310,310,793	\$16,761,800,000
Naval Aviation	\$3,366,529,000	\$4,875,000,000	\$3,790,130,000
Army Aviation	\$28,151,784	\$13,619,125	\$21,516,100
<i>(Includes maintenance, procurement and air defense research and development)</i>			
TOTAL	\$28,193,746,156	\$27,341,330,915	\$20,580,437,100

Spending Planned

	1952 FISCAL (ACTUAL)	1953 FISCAL (ESTIMATED)	1954 FISCAL (ESTIMATED)
Air Force	\$12,519,879,774	\$12,512,000,000	\$10,470,800,000
Naval Aviation	\$2,162,357,876	\$2,990,000,000	\$2,940,000,000
TOTAL	\$14,772,237,650	\$15,502,000,000	\$13,410,800,000

Aircraft and Related Procurement

Money Requested

	1952 FISCAL (ACTUAL)	1953 FISCAL (ESTIMATED)	1954 FISCAL (ESTIMATED)
Air Force	\$11,243,911,218	\$12,654,000,000	\$8,600,000,000
Naval Aviation	\$4,113,000,000	\$5,995,000,000	\$2,274,170,000
Army	\$7,994,214	\$7,970,125	\$10,635,915
Total	\$13,360,999,476	\$15,619,125,125	\$9,899,196,915

Spending Planned

	1952 FISCAL (ACTUAL)	1953 FISCAL (ESTIMATED)	1954 FISCAL (ESTIMATED)
Air Force	\$4,766,897,188	\$6,800,000,000	\$5,000,000,000
Naval Aviation	\$1,766,772,146	\$2,610,000,000	\$2,800,000,000
Total	\$6,533,669,334	\$9,410,000,000	\$7,800,000,000

paired Army aviation, particularly its helicopter units.

There is no provision in the fiscal 1954 Defense Department budget for increasing the Korean war effort June 30, 1953. If the war continues beyond that date, a supplemental appropriation will be necessary to finance it.

By the end of fiscal 1953, the armed forces must have an active inventory of 57,000 aircraft—23,000 in the Air Force, 13,000 in the Navy and Marines and 3,000 in the Army.

Here are the aviation highlights of the fiscal 1954 budget requests by agency:

Air Force

The Air Force agency got the lion's share of the Defense Department budget with a request for \$16.8 billion of the department's \$21.5-billion total. This compares with \$12.3 billion for

fiscal 1953 and \$12.9 billion for fiscal 1952. It is about four times the pre-Korean 1950 budget of \$4.6 billion.

Based on its current budget estimate, USAF expects to have 100 new but wings activated by next June 30 and 133 wings scheduled for service by June 1954. This program would leave USAF 16 combat wings short of its 143-wing goal.

• **Operations Increased.** The larger combat forces available in fiscal 1954 necessitate an increase in maintenance and operations funds from \$4,650 million for fiscal 1953 to \$6,255 million for fiscal 1954. This fund is allocated in three parts:

• **Operation of aircraft—\$3,321 million.** Includes procurement of spare parts, spare parts, gas, oil and other aircraft necessities, and maintenance of aircraft necessary to support the five-group mission of the regular Air Force and Air National Guard.

• **Logistical support—\$2,249,250,000.** Provides for depot maintenance of all aircraft in the active inventory, operation of the USAF depot supply system and commercial air transportation which is required to distribute USAF supplies.

• **Training support—\$239 million.** Provides for an increase in pilot training from the annual rate of 15,000 scheduled to be achieved by the end of fiscal 1953 to a rate of 12,000 a year for fiscal 1954. Technical training rates also will increase.

• **Operational support—\$604,134,000.** Provides for maintenance and operation of bases and facilities acquired by USAF committed to build their own but not sufficient operation of order winging and fighter control networks, etc. Active operational support units involved in fiscal 1954 was set at 120, an increase of 49 over the 71 programmed in 1953.

• **Research and test support—\$90 million.** Provided for operation of USAF facilities and installations supporting the research and development program. This includes static testing, flight, instrument and aircraft test centers, and aircraft test and development centers.

• **Reserve Double.** USAF plans to more than double its reserve force in 1954, increasing from 14,559 active and reserve in 1953 to a total of 34,282 for 1954.

The total includes 3,614 pilots and aircrews. Air National Guard will account for its annual strength of 27,000 but wings plus supporting units in 1954, as the last units are released from federal service to state jurisdiction. A total of 22 ANG combat wings will return from active duty during 1953. The Air ROTC program is scheduled for operation at 130 colleges and universities during 1954 with a peak enrollment of 17,000 and an annual pool of 16,000 new USAF reserve officers.

The title construction from the Defense Department budget is the \$700 million allocated for building USAF bases overseas.

Navy

The Navy and Marine Corps plans to increase in the 16 carrier air group and three Marine air wings achieved during 1953. Emphasis on three procurement programs will be on replacement of obsolete piston powered equipment with modern jet aircraft.

Funds for the third Fleet-class aircraft carrier are included in the 1954 budget.

In addition to the \$2,214,174,000 for procurement of aircraft and related equipment, the Navy has requested \$1,035 million for aircraft and fields

Proposed Air Power Allocations for 1954

Under President Truman's proposed budget, this is how the services plan to allocate funds in selected aviation categories in the 1954 fiscal year, compared with previous years. Figures reflect both actual expenditures and obligations incurred through new contracts.

	1952 Fiscal (Actual)	1953 Fiscal (Actual)	1954 Fiscal (Proposed)	1954 Fiscal (Revised) (Proposed)
Air Force				
Aircraft, parts, equipment procurement	\$19,417,589,818	\$19,484,387,902	\$6,166,130,000	
Aircraft maintenance	57,000,000	115,947,000	117,400,000	
Ground mobile and surge force	1,753,712	16,375,531	5,000,000	
Aviation and communication equipment procurement	311,726,471	432,799,615	300,800,000	
Training equipment procurement	80,351,718	87,364,365	47,000,000	
Construction, 1-4	440,531,453	1,836,798,176	380,075,000	
Communications, aviation	404,584,106	696,370,706	1,008,634,000	
Research and development	435,741,185	501,169,117	317,100,000	
(a) Aircraft	42,546,185	59,127,000	35,100,000	
(b) Ground mobile	113,631,294	127,209,441	150,700,000	
(c) Programs	66,879,006	91,244,294	112,217,000	
(d) Avionics	16,046,716	61,776,414	78,175,000	
(e) Avionics	50,369,441	25,352,856	40,700,000	
(f) Equipment	29,431,264	44,552,386	55,115,000	
(g) Avionics	60,871,924	67,417,431	59,900,000	
(h) Ground mobile	16,936,178	36,675,882	11,564,000	
(i) Laboratory operations	3,679,761	6,879,667	3,900,000	
Naval Aviation				
Aircraft, parts, equipment procurement	1,718,406,695	2,709,172,341	1,950,341,000	
Aircraft maintenance	72,326,700	90,368,360	105,556,000	
Ground mobile and surge force	52,146,288	62,108,000	172,170,000	
Aviation equipment procurement	11,233,900	11,158,000	35,000,000	
Aircraft maintenance	25,473,900	36,618,000	51,919,000	
Research and development	16,217,331	301,006,000	100,000,000	
Industrial substitution	8,679,974	6,480,000	2,416,000	
Army Aviation				
Aircraft procurement	98,998,236	17,967,815	138,062,317	
Electronic and communication equipment	188,441,121	301,463,219	229,615,000	
Avionics and ground mobile	3,363,364,341	2,807,206,399	1,576,655,000	
Research and development (air, ground and electronic)	39,315,531	62,971,400	76,615,367	

ties. This is an increase over the \$953,700,000 allocated in 1953 and reflects a boost in Naval and Marine Corps flight activity during the 1954 fiscal year.

• **Coastal Guard Mikesen-Navy** has allocated \$21,647,000 to begin allocating this year a large number of its ships to coastal units with guided missiles.

The first appropriation of \$45,254,000 for this purpose was made last year. The additional allocation is an addition to \$177,178,000 committed for guided missile procurement.

A \$2,416,000 fund requested for industrial substitution will be devoted primarily to development of new production methods aimed at accelerated production rates.

Army

The Army more than doubled its aircraft procurement request for fiscal 1954 with \$1,918,935,915 compared to \$768,675,015 for fiscal 1953. Bulk of the new funds will be devoted to purchase of large cargo helicopters to be operated by the Army Transportation Corps. Army will spend a substantial part of its \$3,527,685,000 authorization and guided missiles request for aircraft procurement, primarily the Douglas Nike.

Army has requested \$16,533,000 for research and development on electronic landing equipment and will devote part of these funds to development of new types of cargo helicopters. Another fund of \$79,195,167 for an aircraft

Technique research will be used for missiles, electronic equipment and rules for control systems.

CAA

The Civil Aeronautics Administration has requested \$200,125,000 in new authorizations for 1954 compared with \$143,857,642 approved for 1953. CAA estimates of well spend \$174,628,554 in fiscal 1954 compared with \$161,300,037 in 1953. Biggest drop in the CAA account is \$65 million requested for the federal airport program—313 million in new grants and 570 million to locate facilities consistent with domestic

President Truman noted in his budget message that airport construction had been deferred to defense appropriations since the Korean emergency, and he felt the time now had come to resume the program authorized by the Federal Airport Act of 1946.

Other CAA budget items include:

- Aviation safety—\$1,386,000
- Aircraft operations—\$67,000,000
- Airport development—\$373,000
- Public information—\$578,000
- Aircraft operations—\$2,570,000
- Establishment of air navigation facilities—\$20 million, including \$7 million to liquidate prior contract obligation
- Technical development—\$1,163,000
- Washington National Airport—

Post Office

The Post Office has requested \$142,151,000 to pay for air mail in fiscal 1956. President Truman noted that 571 million of this fund represents a subsidy to airlines, according to information furnished him by Civil Aeronautics Board. The subsidy largely is for foreign mail and helicopter operations. Post Office estimates revenue of \$172,148,930 from domestic air mail and \$11,370,080 from foreign air mail during fiscal 1954.

NACA

The National Advisory Committee for Aeronautics has requested an \$11-million increase for fiscal 1971-72 over 1970-71. NACA estimates that \$65,700,000 in 1970-71 was expended at all speeds, with \$75 million in 1971 compared with \$76 million in 1970. Biggest increase in new authorization is for basic research, an \$18-million increase, from a nominal \$10-million ceiling. High-speed windtunnels at Langley and Ames, Langston construction of a new, small high-speed tunnel at Langley, building a new rocket engine test facility at Lewis Laboratories, modifying a Langston-based free-surface stratospheric nozzle and replacing flow accumulators at the Wallops Island Missile Test Co-

Planes on Hand—

The following figures show the number of aircraft scheduled to be in the active inventory of the military services on June 30, 1933, and of April 1933.

USAF	21,000
Navy	25,000
Army	3,000
TOTAL	49,000

Hawkey Hunter and the French Mirage fighter.

An \$16 million order for five Mystère IVs is expected shortly by the official U.S. off-shore procurement program. An announcement of a similar contract for the Hunter is expected in the near future.

Subversion of the Hunter for the September South is the off-shore program in "practically decided," MSA officials say.

A decision to change from the Swift to the Hunter is based primarily on evaluation reports of the two jet interceptors in terms of American experts. **Swift Falls:**—The Swift was known to have faults that could not be fixed by an MSA contract when it was considered for NATO operations by USAF engineers. British and U.S. experts believed the faults could be more difficult than run repaired.

U.S. officials believe production of the Hunter can be handled more easily than the Swift, with early deliveries of finished Hunters to European NATO forces.

A June 1975 deadline imposed by the U.S. Congress for delivery of all off-shore procurements is not the primary reason for the switch from the Swift to the Hunter, officials here say. An MSA order could not be completed by other means at Hunter to meet the deadline.

But prospects that Hunter production could increase rapidly give the plane a great advantage in collection by American officials, who are concerned about getting enough fighters into operation at the earliest possible date.

Excess Rail Rates On Plane Parts Cited

Adm. Donald C. Bennett, president of Aero Industries Inc., says the inadequate Government Contracting Administration's (GCA) failure to curb "excessive" rates for rail shipment of aircraft parts.

The stated reason given by GCA was that it is "expensive" to ship two more tons of materials over two weeks is much per ton and 15 times more per ton in hauling aircraft parts than in any other commodity.

"Establishment of rates consistent with those charged for transportation of other goods would result in savings of millions of dollars," Bennett says, "and lead to the aircraft industry but to the taxpayer."



Robert Lovett

Lovett Says Defense Not Geared For War

Secretary of Defense Robert Lovett said Congress is a party to a "strategic error" in the Defense Department's use of a "smooth sailing" operation to risk a "catastrophic breakdown" of its readiness in the event of war.

Lovett recommended that the Secretary should be given some effective control over the armed forces. To require that, he should be allowed a military staff responsible only to him.

Dollar Control:—The Secretary may largely control control over the services "through the budget process," Lovett said, "the dollar being the single common denominator of all requirements."

"In the event of war, the dollar control will become especially useful," he noted. "The Secretary of Defense would... find himself unable to handle the distribution of shortages in an efficient and direct fashion. It would be these circumstances be necessary, I believe, to undertake a reorganization which would not only seriously decrease the effective procurement of the war but also direct funding. It would be the necessary authority was granted from the Congress."

"We should not deliberately maintain a Department of Defense organization which in normal parts would require drastic reorganization to fight a war. This reorganization can be made in an orderly fashion under the present workload without too much difficulty."

Lovett pointed:

• That the Joint Chiefs of Staff be made a strategic planning body. To accomplish this, he suggested that the Chief delegator then arrive command functions to the Vice Chiefs of Staff as that the JCS be composed of senior officers having no command post.

- That MacArthur Board be abolished and its authority over military production and procurement be transferred to the Secretary of Defense.
- That a thorough study of the national organization of the three services be made to determine if they are functionally effective.

Big Fly-By

- Military air show is set for inaugural parade.
- B-47 squadron will make first public appearance.

A U.S. military air parade of 400 planes and helicopters will fly above the Washington inaugural parade route of President Richard D. Eisenhower, Jan. 16, as a combined tribute of Air Force, Navy and Marine aerial units.

Meanwhile, CAA warned airlines pilots to stay within a 50 mi. radius of the city during the one day period, 11 a.m. to 5 p.m. Pilots were also alerted in the area were asked to fly at not less than 4,000 ft. and to maintain contact with Washington Airport tower for traffic control information.

United Control:—The military planes, under unified control of a special Air Force Control team from Air Proving Ground Command, will fly at about 3,000-3,500 ft.

Forecast plans call for cancellation of the aerial show if weather conditions drop below a 3,000-ft ceiling and six mile visibility.

The two largest formations of big transport aircraft flown in the parade, 25 Air Force C-119s and 20 Marine Sikorsky HH-3s, will be an early feature of the parade, along with 212 Air Force, Navy and Marine fighters, 10 B-47 jet bombers and 24 Marine attack helicopters and many other types.

Types Listed:—The complete air parade by types follows:

• Army attack planes, AC-119s, assault planes, 32 C-130A, C-130B, C-130C, C-130D, C-130E, C-130F, C-130G, C-130H, C-130I, C-130J, C-130K, C-130L, C-130M, C-130N, C-130O, C-130P, C-130Q, C-130R, C-130S, C-130T, C-130U, C-130V, C-130W, C-130X, C-130Y, C-130Z, C-130AA, C-130AB, C-130AC, C-130AD, C-130AE, C-130AF, C-130AG, C-130AH, C-130AI, C-130AJ, C-130AK, C-130AL, C-130AM, C-130AN, C-130AO, C-130AP, C-130AQ, C-130AR, C-130AS, C-130AT, C-130AU, C-130AV, C-130AW, C-130AX, C-130AY, C-130AZ, C-130BA, C-130BB, C-130BC, C-130BD, C-130BE, C-130BF, C-130BG, C-130BH, C-130BI, C-130BJ, C-130BK, C-130BL, C-130BM, C-130BN, C-130BO, C-130BP, C-130BQ, C-130BR, C-130BS, C-130BT, C-130BU, C-130BV, C-130BW, C-130BX, C-130BY, C-130BZ, C-130CA, C-130CB, C-130CC, C-130CD, C-130CE, C-130CF, C-130CG, C-130CH, C-130CI, C-130CJ, C-130CK, C-130CL, C-130CM, C-130CN, C-130CO, C-130CP, C-130CQ, C-130CR, C-130CS, C-130CT, C-130CU, C-130CV, C-130CW, C-130CX, C-130CY, C-130CZ, C-130DA, C-130DB, C-130DC, C-130DD, C-130DE, C-130DF, C-130DG, C-130DH, C-130DI, C-130DJ, C-130DK, C-130DL, C-130DM, C-130DN, C-130DO, C-130DP, C-130DQ, C-130DR, C-130DS, C-130DT, C-130DU, C-130DV, C-130DW, C-130DX, C-130DY, C-130DZ, C-130EA, C-130EB, C-130EC, C-130ED, C-130EE, C-130EF, C-130EG, C-130EH, C-130EI, C-130EJ, C-130EK, C-130EL, C-130EM, C-130EN, C-130EO, C-130EP, C-130EQ, C-130ER, C-130ES, C-130ET, C-130EU, C-130EV, C-130EW, C-130EX, C-130EY, C-130EZ, C-130FA, C-130FB, C-130FC, C-130FD, C-130FE, C-130FF, C-130FG, C-130FH, C-130FI, C-130FJ, C-130FK, C-130FL, C-130FM, C-130FN, C-130FO, C-130FP, C-130FQ, C-130FR, C-130FS, C-130FT, C-130FU, C-130FV, C-130FW, C-130FX, C-130FY, C-130FZ, C-130GA, C-130GB, C-130GC, C-130GD, C-130GE, C-130GF, C-130GG, C-130GH, C-130GI, C-130GJ, C-130GK, C-130GL, C-130GM, C-130GN, C-130GO, C-130GP, C-130GQ, C-130GR, C-130GS, C-130GT, C-130GU, C-130GV, C-130GW, C-130GX, C-130GY, C-130GZ, C-130HA, C-130HB, C-130HC, C-130HD, C-130HE, C-130HF, C-130HG, C-130HH, C-130HI, C-130HJ, C-130HK, C-130HL, C-130HM, C-130HN, C-130HO, C-130HP, C-130HQ, C-130HR, C-130HS, C-130HT, C-130HU, C-130HV, C-130HW, C-130HX, C-130HY, C-130HZ, C-130IA, C-130IB, C-130IC, C-130ID, C-130IE, C-130IF, C-130IG, C-130IH, C-130II, C-130IJ, C-130IK, C-130IL, C-130IM, C-130IN, C-130IO, C-130IP, C-130IQ, C-130IR, C-130IS, C-130IT, C-130IU, C-130IV, C-130IW, C-130IX, C-130IY, C-130IZ, C-130JA, C-130JB, C-130JC, C-130JD, C-130JE, C-130JF, C-130JG, C-130JH, C-130JI, C-130JJ, C-130JK, C-130JL, C-130JM, C-130JN, C-130JO, C-130JP, C-130JQ, C-130JR, C-130JS, C-130JT, C-130JU, C-130JV, C-130JW, C-130JX, C-130JY, C-130JZ, C-130KA, C-130KB, C-130KC, C-130KD, C-130KE, C-130KF, C-130KG, C-130KH, C-130KI, C-130KJ, C-130KK, C-130KL, C-130KM, C-130KN, C-130KO, C-130KP, C-130KQ, C-130KR, C-130KS, C-130KT, C-130KU, C-130KV, C-130KW, C-130KX, C-130KY, C-130KZ, C-130LA, C-130LB, C-130LC, C-130LD, C-130LE, C-130LF, C-130LG, C-130LH, C-130LI, C-130LJ, C-130LK, C-130LL, C-130LM, C-130LN, C-130LO, C-130LP, C-130LQ, C-130LR, C-130LS, C-130LT, C-130LU, C-130LV, C-130LW, C-130LX, C-130LY, C-130LZ, C-130MA, C-130MB, C-130MC, C-130MD, C-130ME, C-130MF, C-130MG, C-130MH, C-130MI, C-130MJ, C-130MK, C-130ML, C-130MM, C-130MN, C-130MO, C-130MP, C-130MQ, C-130MR, C-130MS, C-130MT, C-130MU, C-130MV, C-130MW, C-130MX, C-130MY, C-130MZ, C-130NA, C-130NB, C-130NC, C-130ND, C-130NE, C-130NF, C-130NG, C-130NH, C-130NI, C-130NJ, C-130NK, C-130NL, C-130NM, C-130NN, C-130NO, C-130NP, C-130NQ, C-130NR, C-130NS, C-130NT, C-130NU, C-130NV, C-130NW, C-130NX, C-130NY, C-130NZ, C-130OA, C-130OB, C-130OC, C-130OD, C-130OE, C-130OF, C-130OG, C-130OH, C-130OI, C-130OJ, C-130OK, C-130OL, C-130OM, C-130ON, C-130OO, C-130OP, C-130OQ, C-130OR, C-130OS, C-130OT, C-130OU, C-130OV, C-130OW, C-130OX, C-130OY, C-130OZ, C-130PA, C-130PB, C-130PC, C-130PD, C-130PE, C-130PF, C-130PG, C-130PH, C-130PI, C-130PJ, C-130PK, C-130PL, C-130PM, C-130PN, C-130PO, C-130PP, C-130PQ, C-130PR, C-130PS, C-130PT, C-130PU, C-130PV, C-130PW, C-130PX, C-130PY, C-130PZ, C-130QA, C-130QB, C-130QC, C-130QD, C-130QE, C-130QF, C-130QG, C-130QH, C-130QI, C-130QJ, C-130QK, C-130QL, C-130QM, C-130QN, C-130QO, C-130QP, C-130QQ, C-130QR, C-130QS, C-130QT, C-130QU, C-130QV, C-130QW, C-130QX, C-130QY, C-130QZ, C-130RA, C-130RB, C-130RC, C-130RD, C-130RE, C-130RF, C-130RG, C-130RH, C-130RI, C-130RJ, C-130RK, C-130RL, C-130RM, C-130RN, C-130RO, C-130RP, C-130RQ, C-130RR, C-130RS, C-130RT, C-130RU, C-130RV, C-130RW, C-130RX, C-130RY, C-130RZ, C-130SA, C-130SB, C-130SC, C-130SD, C-130SE, C-130SF, C-130SG, C-130SH, C-130SI, C-130SJ, C-130SK, C-130SL, C-130SM, C-130SN, C-130SO, C-130SP, C-130SQ, C-130SR, C-130SS, C-130ST, C-130SU, C-130SV, C-130SW, C-130SX, C-130SY, C-130SZ, C-130TA, C-130TB, C-130TC, C-130TD, C-130TE, C-130TF, C-130TG, C-130TH, C-130TI, C-130TJ, C-130TK, C-130TL, C-130TM, C-130TN, C-130TO, C-130TP, C-130TQ, C-130TR, C-130TS, C-130TT, C-130TU, C-130TV, C-130TW, C-130TX, C-130TY, C-130TZ, C-130UA, C-130UB, C-130UC, C-130UD, C-130UE, C-130UF, C-130UG, C-130UH, C-130UI, C-130UJ, C-130UK, C-130UL, C-130UM, C-130UN, C-130UO, C-130UP, C-130UQ, C-130UR, C-130US, C-130UT, C-130UU, C-130UV, C-130UW, C-130UX, C-130UY, C-130UZ, C-130VA, C-130VB, C-130VC, C-130VD, C-130VE, C-130VF, C-130VG, C-130VH, C-130VI, C-130VJ, C-130VK, C-130VL, C-130VM, C-130VN, C-130VO, C-130VP, C-130VQ, C-130VR, C-130VS, C-130VT, C-130VU, C-130VV, C-130VW, C-130VX, C-130VY, C-130VZ, C-130WA, C-130WB, C-130WC, C-130WD, C-130WE, C-130WF, C-130WG, C-130WH, C-130WI, C-130WJ, C-130WK, C-130WL, C-130WM, C-130WN, C-130WO, C-130WP, C-130WQ, C-130WR, C-130WS, C-130WT, C-130WU, C-130WV, C-130WW, C-130WX, C-130WY, C-130WZ, C-130XA, C-130XB, C-130XC, C-130XD, C-130XE, C-130XF, C-130XG, C-130XH, C-130XI, C-130XJ, C-130XK, C-130XL, C-130XM, C-130XN, C-130XO, C-130XP, C-130XQ, C-130XR, C-130XS, C-130XT, C-130XU, C-130XV, C-130XW, C-130XX, C-130XY, C-130XZ, C-130YA, C-130YB, C-130YC, C-130YD, C-130YE, C-130YF, C-130YG, C-130YH, C-130YI, C-130YJ, C-130YK, C-130YL, C-130YM, C-130YN, C-130YO, C-130YP, C-130YQ, C-130YR, C-130YS, C-130YT, C-130YU, C-130YV, C-130YW, C-130YX, C-130YY, C-130YZ, C-130ZA, C-130ZB, C-130ZC, C-130ZD, C-130ZE, C-130ZF, C-130ZG, C-130ZH, C-130ZI, C-130ZJ, C-130ZK, C-130ZL, C-130ZM, C-130ZN, C-130ZO, C-130ZP, C-130ZQ, C-130ZR, C-130ZS, C-130ZT, C-130ZU, C-130ZV, C-130ZW, C-130ZX, C-130ZY, C-130ZZ.

• Navy—21 McDonnell F-4B Phantom II, 20 McDonnell F-4C Phantom II, 20 McDonnell F-4D Phantom II, 20 McDonnell F-4E Phantom II, 20 McDonnell F-4F Phantom II, 20 McDonnell F-4G Phantom II, 20 McDonnell F-4H Phantom II, 20 McDonnell F-4I Phantom II, 20 McDonnell F-4J Phantom II, 20 McDonnell F-4K Phantom II, 20 McDonnell F-4L Phantom II, 20 McDonnell F-4M Phantom II, 20 McDonnell F-4N Phantom II, 20 McDonnell F-4O Phantom II, 20 McDonnell F-4P Phantom II, 20 McDonnell F-4Q Phantom II, 20 McDonnell F-4R Phantom II, 20 McDonnell F-4S Phantom II, 20 McDonnell F-4T Phantom II, 20 McDonnell F-4U Phantom II, 20 McDonnell F-4V Phantom II, 20 McDonnell F-4W Phantom II, 20 McDonnell F-4X Phantom II, 20 McDonnell F-4Y Phantom II, 20 McDonnell F-4Z Phantom II, 20 McDonnell F-4AA Phantom II, 20 McDonnell F-4AB Phantom II, 20 McDonnell F-4AC Phantom II, 20 McDonnell F-4AD Phantom II, 20 McDonnell F-4AE Phantom II, 20 McDonnell F-4AF Phantom II, 20 McDonnell F-4AG Phantom II, 20 McDonnell F-4AH Phantom II, 20 McDonnell F-4AI Phantom II, 20 McDonnell F-4AJ Phantom II, 20 McDonnell F-4AK Phantom II, 20 McDonnell F-4AL Phantom II, 20 McDonnell F-4AM Phantom II, 20 McDonnell F-4AN Phantom II, 20 McDonnell F-4AO Phantom II, 20 McDonnell F-4AP Phantom II, 20 McDonnell F-4AQ Phantom II, 20 McDonnell F-4AR Phantom II, 20 McDonnell F-4AS Phantom II, 20 McDonnell F-4AT Phantom II, 20 McDonnell F-4AU Phantom II, 20 McDonnell F-4AV Phantom II, 20 McDonnell F-4AW Phantom II, 20 McDonnell F-4AX Phantom II, 20 McDonnell F-4AY Phantom II, 20 McDonnell F-4AZ Phantom II, 20 McDonnell F-4BA Phantom II, 20 McDonnell F-4BB Phantom II, 20 McDonnell F-4BC Phantom II, 20 McDonnell F-4BD Phantom II, 20 McDonnell F-4BE Phantom II, 20 McDonnell F-4BF Phantom II, 20 McDonnell F-4BG Phantom II, 20 McDonnell F-4BH Phantom II, 20 McDonnell F-4BI Phantom II, 20 McDonnell F-4BJ Phantom II, 20 McDonnell F-4BK Phantom II, 20 McDonnell F-4BL Phantom II, 20 McDonnell F-4BM Phantom II, 20 McDonnell F-4BN Phantom II, 20 McDonnell F-4BO Phantom II, 20 McDonnell F-4BP Phantom II, 20 McDonnell F-4BQ Phantom II, 20 McDonnell F-4BR Phantom II, 20 McDonnell F-4BS Phantom II, 20 McDonnell F-4BT Phantom II, 20 McDonnell F-4BU Phantom II, 20 McDonnell F-4BV Phantom II, 20 McDonnell F-4BW Phantom II, 20 McDonnell F-4BX Phantom II, 20 McDonnell F-4BY Phantom II, 20 McDonnell F-4BZ Phantom II, 20 McDonnell F-4CA Phantom II, 20 McDonnell F-4CB Phantom II, 20 McDonnell F-4CC Phantom II, 20 McDonnell F-4CD Phantom II, 20 McDonnell F-4CE Phantom II, 20 McDonnell F-4CF Phantom II, 20 McDonnell F-4CG Phantom II, 20 McDonnell F-4CH Phantom II, 20 McDonnell F-4CI Phantom II, 20 McDonnell F-4CJ Phantom II, 20 McDonnell F-4CK Phantom II, 20 McDonnell F-4CL Phantom II, 20 McDonnell F-4CM Phantom II, 20 McDonnell F-4CN Phantom II, 20 McDonnell F-4CO Phantom II, 20 McDonnell F-4CP Phantom II, 20 McDonnell F-4CQ Phantom II, 20 McDonnell F-4CR Phantom II, 20 McDonnell F-4CS Phantom II, 20 McDonnell F-4CT Phantom II, 20 McDonnell F-4CU Phantom II, 20 McDonnell F-4CV Phantom II, 20 McDonnell F-4CW Phantom II, 20 McDonnell F-4CX Phantom II, 20 McDonnell F-4CY Phantom II, 20 McDonnell F-4CZ Phantom II, 20 McDonnell F-4DA Phantom II, 20 McDonnell F-4DB Phantom II, 20 McDonnell F-4DC Phantom II, 20 McDonnell F-4DE Phantom II, 20 McDonnell F-4DF Phantom II, 20 McDonnell F-4DG Phantom II, 20 McDonnell F-4DH Phantom II, 20 McDonnell F-4DI Phantom II, 20 McDonnell F-4DJ Phantom II, 20 McDonnell F-4DK Phantom II, 20 McDonnell F-4DL Phantom II, 20 McDonnell F-4DM Phantom II, 20 McDonnell F-4DN Phantom II, 20 McDonnell F-4DO Phantom II, 20 McDonnell F-4DP Phantom II, 20 McDonnell F-4DQ Phantom II, 20 McDonnell F-4DR Phantom II, 20 McDonnell F-4DS Phantom II, 20 McDonnell F-4DT Phantom II, 20 McDonnell F-4DU Phantom II, 20 McDonnell F-4DV Phantom II, 20 McDonnell F-4DW Phantom II, 20 McDonnell F-4DX Phantom II, 20 McDonnell F-4DY Phantom II, 20 McDonnell F-4DZ Phantom II, 20 McDonnell F-4EA Phantom II, 20 McDonnell F-4EB Phantom II, 20 McDonnell F-4EC Phantom II, 20 McDonnell F-4ED Phantom II, 20 McDonnell F-4EE Phantom II, 20 McDonnell F-4EF Phantom II, 20 McDonnell F-4EG Phantom II, 20 McDonnell F-4EH Phantom II, 20 McDonnell F-4EI Phantom II, 20 McDonnell F-4EJ Phantom II, 20 McDonnell F-4EK Phantom II, 20 McDonnell F-4EL Phantom II, 20 McDonnell F-4EM Phantom II, 20 McDonnell F-4EN Phantom II, 20 McDonnell F-4EO Phantom II, 20 McDonnell F-4EP Phantom II, 20 McDonnell F-4EQ Phantom II, 20 McDonnell F-4ER Phantom II, 20 McDonnell F-4ES Phantom II, 20 McDonnell F-4ET Phantom II, 20 McDonnell F-4EU Phantom II, 20 McDonnell F-4EV Phantom II, 20 McDonnell F-4EW Phantom II, 20 McDonnell F-4EX Phantom II, 20 McDonnell F-4EY Phantom II, 20 McDonnell F-4EZ Phantom II, 20 McDonnell F-4FA Phantom II, 20 McDonnell F-4FB Phantom II, 20 McDonnell F-4FC Phantom II, 20 McDonnell F-4FD Phantom II, 20 McDonnell F-4FE Phantom II, 20 McDonnell F-4FF Phantom II, 20 McDonnell F-4FG Phantom II, 20 McDonnell F-4FH Phantom II, 20 McDonnell F-4FI Phantom II, 20 McDonnell F-4FJ Phantom II, 20 McDonnell F-4FK Phantom II, 20 McDonnell F-4FL Phantom II, 20 McDonnell F-4FM Phantom II, 20 McDonnell F-4FN Phantom II, 20 McDonnell F-4FO Phantom II, 20 McDonnell F-4FP Phantom II, 20 McDonnell F-4FQ Phantom II, 20 McDonnell F-4FR Phantom II, 20 McDonnell F-4FS Phantom II, 20 McDonnell F-4FT Phantom II, 20 McDonnell F-4FU Phantom II, 20 McDonnell F-4FV Phantom II, 20 McDonnell F-4FW Phantom II, 20 McDonnell F-4FX Phantom II, 20 McDonnell F-4FY Phantom II, 20 McDonnell F-4FZ Phantom II, 20 McDonnell F-4GA Phantom II, 20 McDonnell F-4GB Phantom II, 20 McDonnell F-4GC Phantom II, 20 McDonnell F-4GD Phantom II, 20 McDonnell F-4GE Phantom II, 20 McDonnell F-4GF Phantom II, 20 McDonnell F-4GG Phantom II, 20 McDonnell F-4GH Phantom II, 20 McDonnell F-4GI Phantom II, 20 McDonnell F-4GJ Phantom II, 20 McDonnell F-4GK Phantom II, 20 McDonnell F-4GL Phantom II, 20 McDonnell F-4GM Phantom II, 20 McDonnell F-4GN Phantom II, 20 McDonnell F-4GO Phantom II, 20 McDonnell F-4GP Phantom II, 20 McDonnell F-4GQ Phantom II, 20 McDonnell F-4GR Phantom II, 20 McDonnell F-4GS Phantom II, 20 McDonnell F-4GT Phantom II, 20 McDonnell F-4GU Phantom II, 20 McDonnell F-4GV Phantom II, 20 McDonnell F-4GW Phantom II, 20 McDonnell F-4GX Phantom II, 20 McDonnell F-4GY Phantom II, 20 McDonnell F-4GZ Phantom II, 20 McDonnell F-4HA Phantom II, 20 McDonnell F-4HB Phantom II, 20 McDonnell F-4HC Phantom II, 20 McDonnell F-4HD Phantom II, 20 McDonnell F-4HE Phantom II, 20 McDonnell F-4HF Phantom II, 20 McDonnell F-4HG Phantom II, 20 McDonnell F-4HI Phantom II, 20 McDonnell F-4HJ Phantom II, 20 McDonnell F-4HK Phantom II, 20 McDonnell F-4HL Phantom II, 20 McDonnell F-4HM Phantom II, 20 McDonnell F-4HN Phantom II, 20 McDonnell F-4HO Phantom II, 20 McDonnell F-4HP Phantom II, 20 McDonnell F-4HQ Phantom II, 20 McDonnell F-4HR Phantom II, 20 McDonnell F-4HS Phantom II, 20 McDonnell F-4HT Phantom II, 20 McDonnell F-4HU Phantom II, 20 McDonnell F-4HV Phantom II, 20 McDonnell F-4HW Phantom II, 20 McDonnell F-4HX Phantom II, 20 McDonnell F-4HY Phantom II, 20 McDonnell F-4HZ Phantom II, 20 McDonnell F-4IA Phantom II, 20 McDonnell F-4IB Phantom II, 20 McDonnell F-4IC Phantom II, 20 McDonnell F-4ID Phantom II, 20 McDonnell F-4IE Phantom II, 20 McDonnell F-4IF Phantom II, 20 McDonnell F-4IG Phantom II, 20 McDonnell F-4IH Phantom II, 20 McDonnell F-4II Phantom II, 20 McDonnell F-4IJ Phantom II, 20 McDonnell F-4IK Phantom II, 20 McDonnell F-4IL Phantom II, 20 McDonnell F-4IM Phantom II, 20 McDonnell F-4IN Phantom II, 20 McDonnell F-4IO Phantom II, 20 McDonnell F-4IP Phantom II, 20 McDonnell F-4IQ Phantom II, 20 McDonnell F-4IR Phantom II, 20 McDonnell F-4IS Phantom II, 20 McDonnell F-4IT Phantom II, 20 McDonnell F-4IU Phantom II, 20 McDonnell F-4IV Phantom II, 20 McDonnell F-4IW Phantom II, 20 McDonnell F-4IX Phantom II, 20 McDonnell F-4IY Phantom II, 20 McDonnell F-4IZ Phantom II, 20 McDonnell F-4JA Phantom II, 20 McDonnell F-4JB Phantom II, 20 McDonnell F-4JC Phantom II, 20 McDonnell F-4JD Phantom II, 20 McDonnell F-4JE Phantom II, 20 McDonnell F-4JF Phantom II, 20 McDonnell F-4JG Phantom II, 20 McDonnell F-4JH Phantom II, 20 McDonnell F-4JI Phantom II, 20 McDonnell F-4JJ Phantom II, 20 McDonnell F-4JK Phantom II, 20 McDonnell F-4JL Phantom II, 20 McDonnell F-4JM Phantom II, 20 McDonnell F-4JN Phantom II, 20 McDonnell F-4JO Phantom II, 20 McDonnell F-4JP Phantom II, 20 McDonnell F-4JQ Phantom II, 20 McDonnell F-4JR Phantom II, 20 McDonnell F-4JS Phantom II, 20 McDonnell F-4JT Phantom II, 20 McDonnell F-4JU Phantom II, 20 McDonnell F-4JV Phantom II, 20 McDonnell F-4JW Phantom II, 20 McDonnell F-4JX Phantom II, 20 McDonnell F-4JY Phantom II, 20 McDonnell F-4JZ Phantom II, 20 McDonnell F-4KA Phantom II, 20 McDonnell F-4KB Phantom II, 20 McDonnell F-4KC Phantom II, 20 McDonnell F-4KD Phantom II, 20 McDonnell F-4KE Phantom II, 20 McDonnell F-4KF Phantom II, 20 McDonnell F-4KG Phantom II, 20 McDonnell F-4KH Phantom II, 20 McDonnell F-4KI Phantom II, 20 McDonnell F-4KJ Phantom II, 20 McDonnell F-4KL Phantom II, 20 McDonnell F-4KM Phantom II, 20 McDonnell F-4KN Phantom II, 20 McDonnell F-4KO Phantom II, 20 McDonnell F-4KP Phantom II, 20 McDonnell F-4KQ Phantom II, 20 McDonnell F-4KR Phantom II, 20 McDonnell F-4KS Phantom II, 20 McDonnell F-4KT Phantom II, 20 McDonnell F-4KU Phantom II, 20 McDonnell F-4KV Phantom II, 20 McDonnell F-4KW Phantom II, 20 McDonnell F-4KX Phantom II, 20 McDonnell F-4KY Phantom II, 20 McDonnell F-4KZ Phantom II, 20 McDonnell F-4LA Phantom II, 20 McDonnell F-4LB Phantom II, 20 McDonnell F-4LC Phantom II, 20 McDonnell F-4LD Phantom II, 20 McDonnell F-4LE Phantom II, 20 McDonnell F-4LF Phantom II, 20 McDonnell F-4LG Phantom II, 20 McDonnell F-4LH Phantom II, 20 McDonnell F-4LI Phantom II, 20 McDonnell F-4LJ Phantom II, 20 McDonnell F-4LK Phantom II, 20 McDonnell F-4LM Phantom II, 20 McDonnell F-4LN Phantom II, 20 McDonnell F-4LO Phantom II, 20 McDonnell F-4LP Phantom II, 20 McDonnell F-4LQ Phantom II, 20 McDonnell F-4LR Phantom II, 20 McDonnell F-4LS Phantom II, 20 McDonnell F-4LT Phantom II, 20 McDonnell F-4LU Phantom II, 20 McDonnell F-4LV Phantom II, 20 McDonnell F-4LW Phantom II, 20 McDonnell F-4LX Phantom II, 20 McDonnell F-4LY Phantom II, 20 McDonnell F-4LZ Phantom II, 20 McDonnell F-4MA Phantom II, 20 McDonnell F-4MB Phantom II, 20 McDonnell F-4MC Phantom II, 20 McDonnell F-4MD Phantom II, 20 McDonnell F-4ME Phantom II, 20 McDonnell F-4MF Phantom II, 20 McDonnell F-4MG Phantom II, 20 McDonnell F-4MH Phantom II, 20 McDonnell F-4MI Phantom II, 20 McDonnell F-4MJ Phantom II, 20 McDonnell F-4MK Phantom II, 20 McDonnell F-4ML Phantom II, 20 McDonnell F-4MM Phantom II, 20 McDonnell F-4MN Phantom II, 20 McDonnell F-4MO Phantom II, 20 McDonnell F-4MP Phantom II, 20 McDonnell F-4MQ Phantom II, 20 McDonnell F-4MR Phantom II, 20 McDonnell F-4MS Phantom II, 20 McDonnell F-4MT Phantom II, 20 McDonnell F-4MU Phantom II, 20 McDonnell F-4MV Phantom II, 20 McDonnell F-4MW Phantom II, 20 McDonnell F-4MX Phantom II, 20 McDonnell F-4MY Phantom II, 20 McDonnell F-4MZ Phantom II, 20 McDonnell F-4NA Phantom II, 20 McDonnell F-4NB Phantom II, 20 McDonnell F-4NC Phantom II, 20 McDonnell F-4ND Phantom II, 20 McDonnell F-4NE Phantom II, 20 McDonnell F-4NF Phantom II, 20 McDonnell F-4NG Phantom II, 20 McDonnell F-4NH Phantom II, 20 McDonnell F-4NI Phantom II, 20 McDonnell F-4NJ Phantom II, 20 McDonnell F-4NK Phantom II, 20 McDonnell F-4NL Phantom II, 20 McDonnell F-4NM Phantom II, 20 McDonnell F-4NN Phantom II, 20 McDonnell F-4NO Phantom II, 20 McDonnell F-4NP Phantom II, 20 McDonnell F-4NQ Phantom II, 20 McDonnell F-4NR Phantom II, 20 McDonnell F-4NS Phantom II, 20 McDonnell F-4NT Phantom II, 20 McDonnell F-4NU Phantom II, 20 McDonnell F-4NV Phantom II, 20 McDonnell F-4NW Phantom II, 20 McDonnell F-4NX Phantom II, 20 McDonnell F-4NY Phantom II, 20 McDonnell F-4NZ Phantom II, 20 McDonnell F-4OA Phantom II, 20 McDonnell F-4OB Phantom II, 20 McDonnell F-4OC Phantom II, 20 McDonnell F-4OD Phantom II, 20 McDonnell F-4OE Phantom II, 20 McDonnell F-4OF Phantom II, 20 McDonnell F-4OG Phantom II, 20 McDonnell F-4OH Phantom II, 20 McDonnell F-4OI Phantom II, 20 McDonnell F-4OJ Phantom II, 20 McDonnell F-4OK Phantom II, 20 McDonnell F-4OL Phantom II, 20 McDonnell F-4OM Phantom II, 20 McDonnell F-4ON Phantom II, 20 McDonnell F-4OO Phantom II, 20 McDonnell F-4OP Phantom II, 20 McDonnell F-4OQ Phantom II, 20 McDonnell F-4OR Phantom II, 20 McDonnell F-4OS Phantom II, 20 McDonnell F-4OT Phantom II, 20 McDonnell F-4OU Phantom II, 20 McDonnell F-4OV Phantom II, 20 McDonnell F-4OW Phantom II, 20 McDonnell F-4OX Phantom II, 20 McDonnell F-4OY Phantom II, 20 McDonnell F-4OZ Phantom II, 20 McDonnell F-4PA Phantom II, 20 McDonnell F-4PB Phantom II, 20 McDonnell F-4PC Phantom II, 20 McDonnell F-4PD Phantom II, 20 McDonnell F-4PE Phantom II, 20 McDonnell F-4PF Phantom II, 20 McDonnell

New Planes In This Week's News



CESSNA 310 STARTS TESTS—Above is first flight photo of new Cessna 310 5-place executive transport which flew for first time Jan. 3. All-metal plane has two 215-hp. Continental jet engines and retractable landing gear.



CESSNA 310 CLOSUP—Prominent feature of the new 310 is the 56-gal. wingtip tank containing all the plane's fuel, a noteworthy safety design feature. Retractable landing gear is also new. Plane spans 36 ft. 3 in., length is 27 ft. 3 in. and height is 10 ft. 3 in.

NEW FRENCH TRANSPORT STYLE—New 310 is shown prior to flight test to its smaller predecessor B-10. B-10, 31 will test high speed rate—202-mph. Spans 147 ft. Engines are two 400-hp. Wright C58AL.



SAFETY by Swedlow

... in the Douglas RB-66

The Douglas Aircraft Company's RB-66 is the twin-jet, swept-wing photo-reconnaissance plane developed for the U.S. Air Force, based on the U.S. Navy A-1H attack aircraft. The RB-66 is rated in the 600-700 MPH class and is one of the fastest, most versatile machines of its type yet developed. Swedlow contributes to its safety, performance and efficient operation in developing its superior laminated fiberglass backing for fuel cells. The Swedlow facilities bring to the production lines of American industry 10 years of specialized experience in precision engineering and production of acrylic and laminated fiberglass parts.



LOS ANGELES, CALIFORNIA • YOUNGSTOWN, OHIO



BANSHEE wings pop up and over the main fuselage. Note that fuselage is not covered by folding. Grumman F-108 folds its wings in a new 30-degree angle that still do not come together as in the Banshee. In the Panther, they point outward at about a 60-degree angle.

Wing Folding, Then and Now:



GANNET uses double track in the wing joint, combining the simplicity of direct overhead fold with space saving.

D. H. 10, an early bomber design with steel nonretractability, integral both upper and lower planes at a single rear spar pin.



CORSAIR wings pop up and over almost to the point of wingtip contact.

MOETHLIKE Moth is a French design of vintage 1921. Note again



CUTLASS follows through line of the overhead fold as the tail fin design. Vertical tail and landing gear placement dictate outward position of fold line and small pin line of fold was folded. Note extended leading-edge slots and fine details of hinge joint and landing gear.

An Aviation Week Picture Story

Wing folding is a design refinement found only in the development of aircraft. But within recent memory, it has become the trademark of naval airplane design.

The requirement is set by carrier deck and hangar dimensions, and the designer's job begins there.

The war has produced an interesting variety of methods for folding the wings. The de Havilland 10 and venerable Moth-Mosquito show how it used to be done. More recent examples are the straightforward overhead fold of the McDonnell Panther and the Vought Corsair, and the inclined hinge-on fold of the F4U Corsair and Grumman Panther.



HELLCAT folding by cut was, the

replaced by Leroy Grumman with pop-up and over (according to legend) and was inclined large over at rear spar. In folding, wing drops down and off, and leading edge is moved roughly parallel to the ground. Models of the Wildcat and all Avengers used this fold.

FIREFLY folds with an inclined hinge at the rear spar. Leading edge of the wing swings up. Low ground clearance of trailing edge could be a handicap with this system.



Lift Raiser

- Boundary layer control studied in Cessna 309.
- System shortens ground takeoff, landing runs.

Researchers are taking a closer look at boundary layer control for cruise aircraft and landing problems at high speed planes. A cooperative program sponsored by the Office of Naval Research and carried out by the University of Wichita and the Cessna Aircraft Co. indicates the possibility of shorter ground runs, increased payloads and more safety.

The project encompasses diverting some of an aircraft's installed power for production of additional lift.

• **German Data**—The University of Würzburg recently got a contract from GNR in January 1949, to study the problem of low-level flight. Now, was interested in the because of its operation of acts from Germany.

One of the first steps in this program was to evaluate the German interest on the subject, brought to this country at the end of the war. Much work had been done by the Germans to achieve high lift, with particular emphasis on boundary layer control. But the end of the war prevented flight tests of the Ando 252, thus placing its investigating the boundary layer control problem.

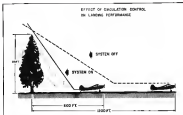
• **Cessna Test Plane**—A proposal was made to fill the lightweight gap in the German work. In January 1951, CNR contracted with Cessna to modify their Model 170 to accommodate a brand-new type control system. This plane was given the designation Model 300.

Primary purpose of the study with the boundary layer control installation was to investigate the wing aerodynamics and flight characteristics of a plane operating at lift coefficients between 1.5 and 4.0.

The arrangement in the converted plane consists of a "suction" flap along the inboard portion of the wing and a "blowing" flap along the outboard portion. Air, drawn into a slot which is formed in the flap is deflected, is then blown upstream outboard by a pumping arrangement and is finally ejected above and ahead of a single slotted flap along the outboard portion of the wing span.

A section of the blowing flap is differentially controlled as an airsonic and is deflected slightly less than the remainder of the flap area.

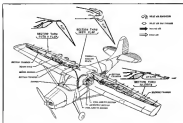
► **What Air Does**—Action of the air flowing in the suction slot prevents turbulent separation on the upper surface.



PRIMARY LAYER CONTROL: installed in Class 170 alloy sharp-angle bitdown on lead backing by cutting in half runway length needed for standard result.



TEST PLANE used to verify predicted high life performance of blowing fan row



PERFORMANCE of system used to keep files of no smooth over time at low costs



Eight ABB30 COMMANDERS are rolling from the production line of the factory of the Aero Design and Engineering Company each month. First airplane of its category to be built and delivered to a civilian market since World War II, 31 of these new high-performance executive transports already have gone to work in the service of some of the leading business firms of the country.



AERODYNAMIC Commander

TULANE AIRPORT • OKLAHOMA CITY, OKLAHOMA

We may have to
STRETCH a bit...



...but we'll fill your order, and fill it fast. For here at Clary, we combine a huge stock of bonded AN and NAS hardware with an experienced staff eager to pitch in and help you. That's why you save time by calling Clary first.



**AIRCRAFT
HARDWARE
DIVISION**

Serving the Aircraft Industry Since 1918

For complete information, write: Who is Who in Aircraft Hardware Division, 421 E. 34th St., New Rochelle, N.Y. 10801
/Circle 30 on Reader Service Card/

tion of the suction flap, with an increase of section increases lift coefficient of as much as 15%.

Secondly, an blow over the dotted flap enlarges the boundary layer and causes adherence to the upper profile of the blowing flap all the way to the trailing edge, with a similar improvement in maximum lift coefficient.

The added curvature of the blowing air, as it is directed downward, also adds to relief effects—over.

► **Pump Arrangement**—For the pump, an engine in the wing. University of Wichita researchers developed a layout for a jet pump using hot gases. An Allison gas turbine compressor, similar to those used as starters for jet crafts, provided the pump air supply. This air was brought to about 1,400°K by heating fuel between the turbine and the pump. Cessna reports that the pump operated at a very low efficiency.

Weight of the turbine and all its controls, plus allowance for pilot, fuel and flight test instrumentation, brought the plane to a normal gross for the commercial version of the Model 170.

► **Flight Results**—First flight of the modified plane verified the high lift predictions for the wing and indicated that no unusual flight characteristics were present.

Cessna jet stalls were removed in character and occurred 15 mph slower than with the conventional plane using full flaps. Lateral control was satisfactory even with ailerons in a 30-deg deflected position.

The company's data both the steady and gusty lift and stall lift were used in maximum thrust and landing.

Some 40% saving in takeoff ground run was obtained with the boundary-layer plane over that with the standard craft. Complete stage after landing touchdowns were made within four lengths of the airplane and level flight was made with a low fuel draw, the ground at an indicated speed of 40 mph—about 11 mph slower than the stall speed of the conventional plane. Power required for level flight at this very low speed was about 30% of normal installed power.

► **Drag Rise Reduced**—Other ideas how obtained emphasize the potential of this boundary layer control system for takeoff and landing.

Cessna reports that one of the most significant results concerns the lift-drag relationship at lift coefficients of 1.5 to 4.0. Most aircraft which take off with flaps are limited in usable flap deflection by the rapid drag rise as rolling over large flap deflections and the resultant drag.

This drag rise, which increases as the square of the lift coefficient, is greatly reduced in the boundary layer control system, Cessna claims, and takeoff and

The quality of Eaton Jet Engine Blades



is assured by newly developed Eaton production processes

As a supplier to aircraft engine manufacturers for many years, Eaton is thoroughly familiar with the problems involved in producing parts to meet the exacting requirements of the industry. We are also accustomed to the developing of specialized production machinery and processes when this is

necessary to meet quality standards and hold costs to a minimum. In our jet blade plant, greatly expanded facilities include exclusive Eaton developments in metallurgy, fabrication, and testing—all combining to produce blades of highest accuracy under strict metallurgical control.

EATON MANUFACTURING COMPANY

CLEVELAND, OHIO

VALVE DIVISION: 5971 FRENCH ROAD • DETROIT 13, MICHIGAN



PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Barrel Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater Delivered Units • Snap Rings • Springs • Spring Washers • Cold Draw Steel • Sawtooth • Leaf and Coil Springs • Dynamic Stems, Rockers, Dynamometers

microcast

7-POINT PROGRAM TO SAVE MONEY

MICROCAST microcast metal aircraft engine parts and hardware were first in the industry—series of sections have been supplied to eight "users." Over 25 years of knowledge are behind the MICROCAST 7-Point Program.

- 1. Castings: Cylinders, Pistons, 7. Titanium: Fueling & Control
- 2. Machine: Spindles & Saw Tires—Speed Products
- 3. Castings: Magnets & Engines for Better Design
- 4. Machine: Equipment and Floor Space

If your operation calls for small, intricately shaped metal parts...you will do well to investigate the Microcast 7-Point Savings Program.

MICROCAST DIVISION
FUTURAL LABORATORIES, INC.
251 East 98th St., New York 16, New York
261 South Chicago Ave., Chicago 9, Ill.

Write for More Microcast Book

loading can be made at lift coefficients of 1.0, with actual improvement to angle of climb. The exact nature of this occurrence has not been determined, but research is underway to uncover the factors underlying the condition.

►New Pump Scheme—The pump system used in the modified plane is not entirely satisfactory because of its weight, Casson claims, but design of other promising methods will be light tested soon.

Test data indicates the possibility of similar installations on high-speed turbo jet planes. One promising system, Casson reveals, would utilize compressed air from the turbine for driving very fast small flow lines to pump the air in the wings.

Calculations have shown that a considerable reduction in jet thrust can be tolerated and improved lift-off and climb still obtained from increased wing lift.

NACA Reports

►Effect of a Finite Trailing-Edge Thickness on the Drag of Rectangular and Delta Wings at Supersonic Speeds (TN 3520, By E. E. Kussler and Conrad Roeschman, Jr.)

Clipping off the trailing edge of a diamond-shaped airfoil reduces its pressure drag under some conditions of supersonic flight, says the NACA in this recent report.

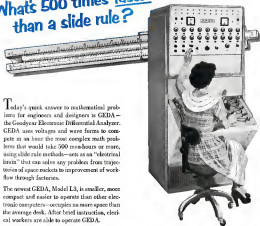
It works this way: Theory shows that for certain conditions of flight, airfoil profiles for minimum pressure drag at supersonic speeds have blunt trailing edges. The effect of this kind of trailing edge is to reduce the pressure drag on the forward surfaces of the airfoil by diminishing the average shock slope of the airfoil surfaces.

At the same time, base pressure drag is increased because of the addition of the blunt trailing edge. However, base pressure drag decreases with increasing Mach number. So there is a point where drag instead will decrease because and where the curves cross. Above this point is where the blunt trailing edge pays off.

Previous NACA investigations of this aspect of drag have been applied to two-dimensional airfoils. But in this technical note the NACA considers a practical application of the idea to the low-aspect-ratio wings of rockets and delta layouts, which are the favored supersonic shapes.

The authors also touched theory to compute surface pressures. They considered the truncated diamond-shaped airfoil because it gives maximum drag for a given thickness ratio. Then they computed the drag of these wing

What's 500 times faster than a slide rule?



GEDA-P-10. Goodyear Aircraft Corporation, Akron 15, Ohio.

Today's quick answer to mathematical problems for engineers and designers is GEDA—the Goodyear Electronic Differential Analyzer. GEDA uses voltages and wave forms to compute in an hour the most complex math problems that would take 500 man-hours or more, using slide rule methods—acts as an "electrical brain" that can solve any problem from trajectories of space rockets to improvement of work-flow through factories.

The newest GEDA, Model L3, is smaller, more compact and easier to operate than other electronic computers—occupies no more space than the average desk. After brief instruction, clerical workers are able to operate GEDA.

A major supplier of computing equipment, Goodyear Aircraft has manufactured GEDA analyzers for five years—operates one of industry's largest computer application laboratories—and is now ready to supply the newest GEDA to industry and government.

Consider the possible applications in your plant for GEDA, the Goodyear Aircraft Electronic Differential Analyzer. Then write for full information to: Goodyear Aircraft Corporation, Department 241, Akron 15, Ohio.

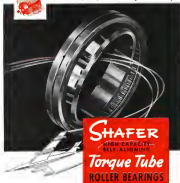


OPPORTUNITIES UNLIMITED—for engineers!

In addition to making and operating GEDA, Goodyear Aircraft is active in many fields for opportunities and in research, design, development and maintenance of airplanes • AIRCRAFT • MISSILES • SPACECRAFT • ELECTRONIC COMPUTERS • AIRCRAFT COMPONENTS • GUARANTEE SYSTEMS • AIRCRAFT • TRANSPARENT ENCLOSURES • AIRCRAFT PARTS • AIRCRAFT STRUCTURES • WHEELS AND BRAKES •

NASA STRUCTURES AND MANY OTHERS. Submit brief resume of your qualifications and experience or write for employment information and further details to Goodyear Aircraft Corporation, Akron 15, Ohio.

Another Example of Shafer Design Leadership



SHAHER
HIGH CAPACITY
SELF-ALIGNING
Torque Tube
ROLLER BEARINGS

The processing and maintenance of advanced roller bearings is a basic part of Shafer's business. After all, the company is a major supplier to the aerospace industry of Shafer "Torque Tube" self-aligning torque tube type double row roller bearings that provide full freedom of rotation and proper alignment whatever straighten deformation occur during flight. It is in fact, the roller bearing and its associated parts which provide the foundation for the Shafer's design and manufacturing capabilities. Shafer's roller bearings are used in a wide variety of applications, from the smallest to the largest, and are used in a wide variety of environments, from the most severe to the most benign.

Shafer's roller bearings are used in a wide variety of applications, from the smallest to the largest, and are used in a wide variety of environments, from the most severe to the most benign.

SHAHER BEARING CORPORATION
201 South Main Ave. • Kansas City, Mo.



Specialties in Aircraft and Industrial Steel
A High Roller Bearing for over 100 years.

with these non-conventional applications with sharp trailing edges. And they worked out the answer for several combinations of aspect ratio and thickness ratio and Mach number from 2 to 5.

The answer point where the drag saving began to show—depends on the wing planform, aspect ratio and thickness ratio. In the case of the Mach number and aspect ratio, the drag savings are greater with the thicker section.

With rectangular wings, aspect ratio produces little effect in drag, but in the delta wing geometry, aspect ratio effects are about equal to thickness of fact in reducing drag.

One parameter used by the authors in calculating the drag effects is the ratio of maximum drag coefficients for the blunt wing and the sharp-edged wing. This ratio decreases with decreasing aspect ratio.

The authors also note that, though they confined their work to delta and rectangular wings, there are signs that the shape will work out for other planforms as well.

► A Special Investigation to Develop a General Method for Three-Dimensional Photoelastic Stress Analysis (JN 2532) —By M. M. Foadi and R. G. Gorman, Jr. Manual treatments of stress analysis results from the "photoelastic" approach to photoelastic stress in this country, says this latest NACA tech note.

In the "freezing" technique, plastic specimens are loaded while in a jig. The loaded piece is then transferred after cooling. The test piece is removed from the jig and placed in a section which is polished to a fine finish. This allows "frozen" stress and strain in the specimen.

Disagreeing slightly with the results of British studies reported earlier in Aviation Week (Jan. 12, p. 34), the authors point out that accuracy of the "frozen" specimen technique depends on the availability of materials with a low value of Poisson's ratio at elevated temperatures. (Poisson's ratio defines the ratio of lateral strain deformation to linear strain deformation in test specimens loaded in tension.)

The newest approaches to such materials are Polystyrene and Bakelite which have lateral values of about one-half. But the "frozen" stress method breaks down at the Poisson ratio approach a value of one-half.

This report notes a method developed by the authors which does not depend on Poisson's ratio, and can therefore be used with Polystyrene and Bakelite models. It uses the "frozen" stress technique but differs from the British reports in the method that is used in determining stresses.

PRODUCTION



DIG PIT for Kaiser's 15,000- and 21,000-ton aluminum forge presses covers more than an acre and is seven stories deep.

Planting of AF's Press Giants Begins

These massive heavyweights, with individual parts weighing as much as 100 tons, need special beds.

By Irving Stone

Aircraft aren't the only things that are complex these days. The huge machines and their special accommodations now being created within the Air Force's heavy press program represent new extremes in the aviation field. So massive are these presses that major construction projects will be assigned to make and locate them. The accompanying photos illustrate the size of the project and the magnitude of the preparations to receive them.

► **Kaiser Installations**—Two forge presses—21,000-ton and 15,000-ton presses—will be built by E. W. Bliss Co.—will be installed at Kaiser Aluminum and Chemical Co.'s Newark, Okla., site. Height of the 15,000-ton unit will measure 72

ft. from top to bottom toward 11 ft. above floor level, 39 ft. below ground. It will weigh 10 million pounds. The area available is 24 x 12 ft. and maximum depth opening—up and down distance from bottom plate to bottom of the area—is 10 ft. The eight beds each measure 57 in. in diameter. Tie-on unit weight about 85 tons each.

Foundation pit for these 25,000 and 15,000-ton presses covers more than an acre of area and required the removal of a large amount of earth. An unstable ground condition requires that the entire press plant be built on a vibratory structure "floating" on the ground aggregate of a gravel over bed, over 200 ft. deep at this point.

► **Alcoa—At Alcoa's Company of**

America's Cleveland works, a 50,000 and a 15,000-ton forge press will be located in a new facility about 10 acres in height.

The latest press, which is under construction at Metals Machine Co., will have an overall height of 80 ft., with 36 ft. of the unit below ground level. The entire press, being built by United Engineering Co., will be 67 ft. high. Reinforced concrete foundations to support the machines will rest on pilings, reaching 75 to 85 ft. down. Alcoa has had a 16,500-ton German press in operation for about a year.

At Alcoa's Lafayette, Ind., plant, a 11,300-ton horizontal extrusion press will be installed. This unit is about midway between the smallest and the largest extruder—3,800 to 38,000 tons—in the heavy press program, and its size is considerable. One casting for the unit—the cylinder housing—weighs more than 215,000 lb., a 5 ft. wide

Jato Release on Republic's F-84 AIRBORNE Actuated

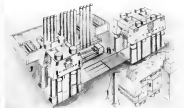


The J-611 actuator (R-600 type) releases its Jato bottles after take-off. The R-611 valve cables on a down and pulls the pins.

The delivery of Actuator's Model R-610 actuator shows the extremely adjustable positive stops which, in conjunction with torque limiting switches, provide accurate positioning at load removal travel. The load may be as high as 200 lbs.

Protection of the rolled casing shell, on both sides of the actuator, helps edge the model R-610 to any application. The weight of the unit, with roller nose drive, is 17 pounds; the speed, at 26 rpm and 240 pound inch load, is 7 rpm. See our insert in the I.A.S. Aeronautical Engineering Catalog for details on this and other Actuator equipment.

AIRBORNE
ACCESSORIES CORPORATION
184 Central Avenue, BOSTON 1, New Jersey



MOORE-BELOW GROUND (top above) will be Kato's new press being built by Waco.



ALCOA'S 14,580 ton press looks small next to new 50,000 and 35,000 tonners.

and 145 ft high. The press plates top 217,481 lb.

► **Raymond Rotomex**—Raymond Rotomex Co. in Phoenix, Ariz., will have a new 652,000-lb. facility to house its 6,000 and 12,000-ton aluminum press. The larger extruder will handle a 5,000 lb. aluminum billet, and have a resist

table several hundred feet long. The tower for housing the vertical heat treat furnace will be 80 ft wide, 240 ft long and 90 ft high.

These are but a few of the major components of heavy presses under the expanded Air Force program, detailed in *Aviation Week*, July 1, p. 15.

Fast Writeoffs

Accelerated tax amortization for non-exhaustible expanding defense facilities is granted by the government in the form of certificate of necessity.

In the following list of recent certificate, company name is given, followed by product or service, cost of construction, dollar amount necessary for defense expansion, and the percentage of the expansion cost allowed for fast write-off. Fast amortization property to be depreciated in five years.

► **Traylor Products Co.**, New Britain, Conn., aircraft parts, \$141,000, 41%.
► **Wabash Machine Co.**, Wabash, Mass., aircraft components, \$64,000, 41%.
► **E. and R. Steel Co.**, East City, Wash., aircraft parts, \$15,100, 51%.

► **Westland of New Co.**, Westford, N. H., aircraft parts, \$11,000, 41%.
► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

► **Waco Aircraft Corp.**, Waco, Tex., aircraft parts, \$14,000, 41%.

also equipped inside tank up to 100 ft to have positioned 120 pieces, while the belt-ground tools give an average of about 200 pieces per subassembly tool.

Reason for the longer lead time is said to be the fact that tools produced by the machine built a 2 to 10-microinch mesh is put on the tool by a 220-grit belt with an arcing produced on the cutting edge.

Work table height can be adjusted in relation to the center wheel to permit an overall relief angle to be easily finished. The relief angle is set by adjusting the height of the table and the force of the cutting tool contacts the

belt on a point on its circumference that corresponds to the angle desired. A vertical gear is connected adjacent to the wheel and proper table height is established by a dovetail angle by aligning the tool cutting edge with the correct angle marking on the gear.

After the clearance angle has been rough-ground with a silicon carbide grinding wheel, the belt-machine table is set to produce the correct relief angle and belt finish and side angles are micro-finished.

Tight manual pressure is enough, and no stop of the cutting tool need be held against the belt for more than 2 or 3 seconds, the machine's action is



Sharpeners Lengthens Carbide Tool Life

Substantially lower maintenance costs and longer life for tungsten carbide tipped cutting tools are dividends reported for a new sharpening scheme. This method, employing a machine known as the *Micro Trans*, incorporates a specially built cast iron coolant wheel and a waterproof silicon carbide paper belt (Opport Unit Disc). The process was developed cooperatively by Behr Manning Corp., Torr, N. Y., and Trans Engineering Co., Rock Hill, S. C.

Costs with the new procedure are reported to be approximately 1/10 less per tool sharpened than with the conventional diamond wheel method. Better results and faster finishing operations are also reported.

In a controlled test made on a production lathe turning 5045 steel alloy, the carbide tools sharpened by diamond wheel are said to have averaged 12 parts per resharpening tool. Those sharpened by the coolant wheel belt completed an average of 40 parts per tool resharpening was required.

On AMS 5040 machining discussed



Check Nut

This is a Vlier Torque Thumb Screw

A trouble-free holding fast that properly supports work pieces against machine tool pressures and automatically prevents their distortion due to overtightening. This assures you of precision machining of even fragile parts.



It Works Like This...

The screwing head contains a ball check that works against acoustically controlled spring pressure. Upon arriving at the pre-determined holding pressure, the head catches, flexes and prevents over-tightening of the screw. ("Right is right enough")

And These Are the Mechanical Details

Body Thread is National Coarse Series Class No. 1-20. Check nut provided on most sizes prevents backing off under shocks, holding pressures range from 8-50 lbs. Assembly and disassembly great. Made of hardened and case-hardened steels. Nothing to wear or break.

Available in Four Types

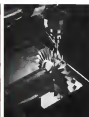
1. Regular—Type A—for external supporting.
2. Inverted—Type B—Reverse of Type A support.
3. Tee Head—Type C—used with sliding V-blocks.
4. Adjustable—Type D—set your own holding pressure.

There is a ready, when drilled in the screw, just 1/16" hole for drilling the 1/2" hole. See also Vlier's, Flange Nuts, Flange Washers, Flange Nuts, Flange Nuts and Flange Nuts.



Vlier Manufacturing Company

4552 Beverly Boulevard, Los Angeles 4, California



Marquardt Designs Special Rotor Mill

Because Marquardt Aircraft Co. could not find an outside manufacturer to supply parts of required tolerance in pace with the engine's appearance, sought engine specialists, the Van Nieu, Cold, firm designed its own special milling machine for the job.

The parts are rotor blades—one used to drive a spur gear train for engine governor, alternator and generator, the other a larger unit, for driving the fuel pump.

The rotor milling machine designed by Marquardt engineers utilizes a complicated series of cams and a four-angle cutting head turning at 1,500 rpm. Cutting in close webs and ends and rotor, bars.

Rotor materials are a chrome molybdenum alloy steel and 145 T aluminum alloy. The blades are cut from a turned blank, with a machining operation that necessitates only a turning operation for final finishing.




High-Temp Wire

Tension high-temperature hook-up wire correlated with the Power Tolerances authorized temperatures ranging from -55C to 700C with little change, according to the manufacturer. Inside too is claimed to be clean stripping, constant contact, resistance to acid and salt and to be able to withstand abrasion. Flexibility, insulation resistance and dielectric strength are claimed as extremely good.

Tension is wire in full-scale production and is available in sizes from AWG 18 through 20 in stranded silver-plated copper conductors. It is also available in special sample lots. It is made in 14 inches in length, taping and finish, sheathing.

Toroidal Insulated Wire, Co., Inc., 136 Main St., Tarrytown, N. Y.


BOEING
B-47 STRATOJET

Equipped with WITTEK Aviation HOSE CLAMPS

WITTEK 18 18T 18W (Designed with one piece design)
WITTEK 20 20T 20W (Designed with one piece design)

STANDARD OF THE INDUSTRY FOR OVER A QUARTER CENTURY



WITTEK MANUFACTURING COMPANY
4305-18 WEST 24th PLACE • CHICAGO 25, ILLINOIS



GYRO LOOKING FOR NEW WORLDS TO CONQUER

We're mighty happy with the performance of our Cagable Vertical Gyro as an amplifier component in lighters and guided missiles—used in color television systems.

But what if the gyro—which can be cycled in under ten seconds, uncaged in only three seconds—has a lot of undeveloped possibilities?

Now that we know that you may have problems and applications of which we are not aware. So if you get any ideas after you've looked over the specs below, drop us a line.

And remember, here at Honeywell we are specialists in the gyro, have become one of the leaders in the field. Our "gyro" family—which includes other vertical, one and the extremely sensitive Electronic Integrating Gyro—is now available to manufacturers who require precise performance.

If you'd like to know more about any of the products in our gyro line, we'd be pleased to send them. The address is Honeywell Aero Division, Dept. 401 (E), Minneapolis 15, Minnesota.

Cagable Vertical Gyro JG 7044A Specifications

Power Requirements: Gyro motor (15 volts, 400 cps \pm 5 cps single phase)
Excitation motor (48 volts, full c/w)
Weight: 10.000 gms. (maximum)
Size: 1.5" x 1.5" x 1.5" (approx.)
Cage time: 10 to 15 sec. (typical)
Uncage time: 3 to 5 sec. (typical)

Excitation motor: 1 watt (each)
Cage operation: 1/2 watt (opening); 1/2 watt (closing)
Drive torque: 10,000 gms. (maximum)
Angular momentum: $\pm 1.5 \times 10^4$ g-cm²/sec.
Preload torque: 2.5 g-cm²/sec.
Cage time: 10 to 15 sec. (typical)
Uncage time: 3 to 5 sec. (typical)
Drive torque: 10,000 gms. (maximum)
Angular momentum: $\pm 1.5 \times 10^4$ g-cm²/sec.
Preload torque: 2.5 g-cm²/sec.
Cage time: 10 to 15 sec. (typical)
Uncage time: 3 to 5 sec. (typical)

Size: 1.5" x 1.5" x 1.5" (approx.)
Weight: 10.000 gms. (maximum)

Honeywell



Aerospace Controls

Wherever You Are

In the United States



You can obtain up-to-date
factory parts for
your Pratt & Whitney
Aircraft engines...
quickly and easily

Check the authorized distributor
of Pratt & Whitney Aircraft
parts nearest you—

PACIFIC AIRMOVIE CORPORATION
Lockwood Air Terminal
Riverside, California
Oakland Municipal Airport
Oakland, California
Reading Field, Seattle, Washington

SOUTHWEST AIRMOVIE COMPANY
Love Field, Dallas, Texas
NORTHWEST AERONAUTICAL COMPANY
Hawkins Field, St. Paul, Minnesota

AIRWORK CORPORATION
McClure Municipal Airport
Midville, New Jersey
20th Street (Davenport International
Airport) Miami, Florida

PACIFIC AIRMOVIE CORPORATION
Union Municipal Airport
Lindero, New Jersey

These leading five national distributors
stock all approved parts for current Pratt
& Whitney Aircraft engines.
Always look for the distinctive factory
parts—Pratt & Whitney marks you of maximum
engine performance.

Pratt & Whitney Aircraft

Our effective division of
United Aircraft Corporation
EAST HARTFORD, CONNECTICUT

Loening Speech Stirs Air Industry

Copies of pioneer's address, criticizing Pentagon and U. S. over-regulation, circulating in aviation circles.

Copies of an outspoken address made recently by Glenn Loening, lambasting overbearing government control over aviation, are being circulated and discussed in air circles.

The subject, a matter of considerable concern among top executives in the aviation and aircraft engine fields, is usually discussed in reference to a topic of conversation except in inner circles of the industry. The general feeling is that it is poor business to attack your best or only market customer.

Mr. Loening spoke before the recent convention of the National Association of State Aviation Officials. He is a pioneer aircraft designer and industrialist. Although not a director, consultant and stockholder in the aircraft industry, he is independent financially, and frequently has spoken out on subjects others in aviation did not see to discuss openly.

■ Glenn Loening (The speaker devoted about half of his address to the "growth of the power-giving psychology of the industry.")

Whether such growth has been accelerated and delayed is the subject of discussion. Loening said, "a subject we can do much to improve upon." Mr. Loening said, "but the facts are that the defense part of the government has begun to take hold of aviation in all its branches in an alarming manner that some of us feel we had better stop and ponder over this right now, before we get involved one degree."

"It is not, he said, to blame the Pentagon entirely for this, said "as the military air forces by the necessity of making a 'showing' for the vast sums that are spent, of preparing for an air war we when nobody knows where to use it in general, and of keeping most of these operations secret."

Then a further complication, he added, by the necessity of justifying their money to a protective economy. "It adds up to a general problem of the military for which we should have an understandable sympathy," he emphasized.

"But, it would seem that the mistake in being made of not discussing enough. It seems to be the repeated folly of big government to make it self even bigger, over more powerful, over more complicated and more invaluable."

■ "Now, Mr. Loening said, we must be realistic to do so well as World War II was that complex and difficult as our operations had become—they

were nothing as compared to the ridiculous extent that the Navy super-regulation had gone to in Germany."

"The broadest view evident when we compared their papers and journals of their elaborate and strictly futile systems piled on top of other systems. It is in this day there are some pointed lessons to learn from."

"With all the elaborate research work and studies and organizations that the Navy had developed, they failed to recognize, for example, the importance of strategic bombing and despite the fact that they were a day-building nation, accuracy of bombing England, Nazi Germany failed utterly to demonstrate the 157, bombing craft, and to achieve anything within the air we developed it an amazingly."

"The organization and operation of these big federal machines in the Pentagon, it seems available that good been could be overlooked because of the apparent wisdom of all circumstances of their activities. But the facts are that they can."

"The reason that they can so simply that as men in profit incentive and industrial nations and authority are subordinated under bureaucratic complexities, progress falls from the level of being inspired by genius to the level of being restricted by second-hand men and orders."

"Look, what has happened in aviation, particularly in the Air Force, Twenty or 30 years ago the designer of a new type of aircraft could design up a new idea that his knowledge of the aircraft might need and obtain considerable help with an abundance to bring his idea to completion."

"Now, things have changed. The Air Force has gone into the research branch and what it even more it has gone into the aircraft design branch on its own."

■ "Red-Tape Delay"—The present system would require a new idea to be submitted to the Air Materiel Command for its comments, and also to the Air Research and Development Command for its comments, and then to various research and development boards and advisory committees in the Pentagon.

"After weeks and months of holding around, most of the poor little new ideas are so worried to death that they either get out of date or get so complicated with so many Air Force ideas of what should be added to them that they have lost their meaning."

"Also, a new design idea does not get started, carbon, in any way, unless it

PSP aircraft SOLENOIDS

QUALITY TESTED



SOLVE YOUR solenoid problems with PSP's line of quality solenoids. Each solenoid is built to order and tested to meet a specific performance standard.



Write for your present copy of the new PSP solenoid catalog.

Lowest manufacturer in the Pacific Coast solenoid catalog quality solenoids exclusively.

PSP ENGINEERING COMPANY

2010 10th Street, San Francisco, California

SOLENOID

GPI

FIRE DETECTOR

AIRCRAFT TYPE

GLASS THERMISTOR

SEAL

CH

100-1

CONVERSION

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

U.S.A. 110-1

Valve Talk

for WM B. WHITTAKER CO., L44

In Marine News

Senior Member, Aviation Writers Assn.



What of the future?

What achievements will be on the record by the end of 1962? Based on the past ten years, fastest decade in history, the possibilities are startling. But to civilians there takes more than a newsmen's perception of past events. The progressions should be done by men who already have authored a good share of the epoch that is aviation.

So I asked two of my favorite experts for their ideas: Ed Ichimura, chief engineer, Douglas F4 Skyhawk (SSB), Skyrocket, Skyraider, Skyhawk, Skyhawk, Skyhawk, ASB), and Bill Hubbard, Lockheed engineering vice president (P-38, Ventura, Super Constellation, Shooting Star, T-33, Corsair, F2V Neptune, C-130A).

How is Ed's thought?

"There is every indication that by 1962 air operations will be coming at speeds between five and six hundred miles per hour, at altitudes of approximately 60,000 feet.

"This is half the speed of the earth's rotation at the equator, or comparable to the rotation of the earth at the latitude of Glasgow, Scotland. It means that in no short time, crossing of the North Atlantic, the sea will appear to remain in almost the same position in the sky. A unique approach is required, since it will mean possible landing at the same time as takeoff.

"Military aircraft speeds already by then be expected to reach such a level that a standard jet approach will be greater than approximately 600 miles per hour in a level and approximately 1,200 miles per hour in higher altitudes unless great improvements in materials and equipment are made.

"This, of course, is not the problem of subsonic transonic flow or the best of air resistance. As such it is not a problem of aerodynamics but rather temperature, this speeds no doubt will increase.

"These concerns are based on some, nevertheless, airplanes that are dependent on the earth's atmosphere for their lift and thrust. In the field of rockets and rocket planes, the air is capable of operating independently of the atmosphere, the limits appear unlimited. Since these developments take much longer, it is desirable that rocket planes will be in a very large-scale operation during the next ten-year period.

"With these are away difficult problems ahead, the future of aviation in the next fifteen years appears almost limitless. The second half of the twentieth

Century—the Air Age—will be even more interesting and productive than the first half."

And now for Bill's ideas on the future.

"The next ten years will see aviation increasingly develop the speeded some will be better. In many airplanes will be flying operationally at level flight that it will be difficult to believe that at that time it was thought there was no comparable barrier at the speed of sound. Not only will there be many level flight operations beyond, but, in addition, there will be level flight operations beyond. At the end of the decade we'll be seeing jet aircraft at a new level—for best barrier.

"Consequently, we will see our most rapid progress in the advance of the pure jet transport with cruising speeds of 600 miles per hour and all 100-passenger capacity. These aircraft on both concepts will also experience in operation below the level of the best pure jet transport airplanes. In the pure jet airplane, there will be new turbo-propeller airplanes carrying passengers in quantities that will be more than even the pure jet airplane.

"The big concern, within the decade, will be an urgent need, first, by pure jet transport and later in the decade to, within possible aircraft to those also carrying passengers (and cargo) by the end of the decade or even by the end of the next decade in volume and price.

At this point may I add my own prediction?

"Whatever the developments, the problems, the achievements of the next decade, year 1962 and what follows will keep pace with such rapid growth, including steady the steady growth of the industry."

has been subjected to what is called the Requirements Division, which is supposed to list all that the Air Force needs or wants based largely on its own experience and reports from the field. Note, however, that in this Portuguese series of activities, nowhere is there a highly experienced person who has also studied the operations of aircraft in the field on such a way as to be able to direct a totally new or improved aircraft, or have any lower echelon officers, none of whom would either have thought of or have been competent to consider a truly new project.

"If there was an inventor looking for help on a new idea, he would have to go to the Requirements Division. He would learn there that, since he was not a member of the staff that does up requirements, a requirement for his invention did not exist. Therefore, it could not be ordered.

"It does not take much of a review to see how badly this super-organization sort of operation in the Air Force has bothered and delayed the real progress of technical aviation in this country.

"Of course, one of the reasons that this questionable Air Research & Development Command was established was on the high recommendations of several Air Force generals like Jimmy Doolittle. No doubt, the possible preservation of secrecy had a good deal to do with their recommendations.

"However, it actually has resulted in the Air Force today being in a position, if for no other, to accelerate the aviation industry almost overnight. Was this the reason?

"The Air Force itself has now thousands of technicians, draftsmen, designers, qualified engineers, etc. (occasionally, spending a good deal of time and using a good deal of paper trying to write letters to each other) who are competing with industry in devising the advancement of aviation.

"The industrial obsolescence of manufacturing in the Air Force is becoming so prevalent—the matter of approach and disposition to customers—the operation is so pervasive—and the permission to do the and that is manufacturing in controlling, that the Air Force is presently doing its own manufacturing in such a manner that the government is already control that the industry is under a few companies that is not too healthy.

"New Look Needs—"Not only do we want to look and see if this is really what we want in America's private enterprise economy, but we also could well look and see whether it is the cheapest and quickest way."

"It certainly is not the cheapest because several new European post-type developments have come about so

of all the World's International Airlines*



out of use

10



AVIATION PRODUCTS

For spanning oceans and continents—where performance counts the most—international airlines rely on ESSO Aviation Products. Airline operators know they can depend on the high quality of these superior petroleum products.

Uniformity of fuel and lubricant, standardization of service and sale, speedy refueling are essential to modern air carriers. Anticipating these vital needs ESSO aviation marketers pioneered the use

of the Hydram Refueling System and today—even at such widely separated airports as Keflavik (Iceland) and Lima (Peru)—ESSO marketers provide the same fast and dependable petroleum service to all pilots.

Yes, ESSO Aviation Products are available along the airway of the world—where you meet them, when you need them.

A GOOD SIGN TO FLY TO



*As listed by C.A.B. "World Directory of Airlines" and International Airline Trade Press



Restrictions on stress forced engineers in the Toolmaster Products Division of McGraw-Hill Electric Company to find substitute materials for a pneumatic damping sleeve on the least sector mechanism. They had been using a cylinder, machined from steel 51 with brass rod, and a piston ground from piston with a connecting rod on a swivel joint. The cylinder head was filled with a spring and ball check valve. Tolerances on this complicated assembly had to be held within 2 mils to give satisfactory performance for at least 100,000 cycles at 350° F.



In pneumatic dampers SILASTIC* ... saves critical materials

Many substitute materials and designs were tried with disappointing results before one of our technical representatives dropped in with samples of Silastic. Using this heat stable, rubbery silicone product, Toolmaster's research and development engineers perfected a very simple and durable damper. It consists of an inexpensive drawn steel cylinder, a 1-piece connecting rod, and a flat disc-shaped Silastic piston mounted loosely between two metal cup washers with a single air lock past the shoulder of the piston.

Tolerances on the new damper are loose; the cylinder can be cut to read, 95 pounds of mild steel displace 199 pounds of brass past 1000 heaters. And the new sleeve works better than the more expensive brass assembly. Such performance proves the usefulness of Silastic as a new engineering material. It retains its rubbery properties and its good elastic properties of temperatures ranging from below -70 to above 500° F. It is highly water repellent, shows excellent resistance to weathering and to a variety of hot oils and chemicals.

For more information on the properties or fabrications of Silastic mold this coupon today or phone our nearest branch office.

New Century Corporation, Dept. B-14, Milford, Mass.

- Please send me:
☐ Silastic facts 196, properties and applications of Silastic sheets and parts.
☐ Use of Silastic Fabrications.
☐ "What's A Silastic?"; your new 32 page booklet on Silastic products and applications.

Name _____ Title _____

Company _____

Address _____

City _____ State _____



ATLANTA • CINCINNATI
 CLEVELAND • DALLAS
 NEW YORK • LOS ANGELES
 WASHINGTON D. C.
 MILWAUKEE, MADISON
 IN CLEVELAND
 Pittsburgh-Corning Ltd., Toronto
 In England
 Milford Silastics Ltd., London

specifically as to make our American system look sharp and sophisticated.

"Also, as we set to explain the clear advance that Europe has in jets and jet transports and many other new developments by the jet engine itself, they suddenly—well, as they say—are not bothered with the superlatives that we have to deal with over here."

"When we approach the question of aviation in the states and between the states of this country, we find that the Postage very little notice and has little expressed interest in how much of our wealth of aviation facilities have been due entirely to private enterprise."

"One of our best military airports is Florida—at least it is now largely military, Maxwell Field, was not started or created by the Air Force at all. This is a typical example of what kind of pioneering helpful activity will be lost to us in development if we allow the military mind and the Postage's tendency to sink to control aviation, is gone at the expense, as they appear to be trying to do."

"Sometime, somewhere, has got to point out that the business of the Postage is not to control aviation in civilian economy. In business it is to shut down the money. That's all. And when it comes to the difficult business of the military moving in an aviation airport, as in the Secretary of the Air Force and the civilian heads of aviation who must tell the military that the civilian economy and its value to war is much too valuable to be disrupted with."

*CAA, CAA Examined—The question and that the Civil Aeronautics Board and Civil Aeronautics Administration should be created so to strengthen civilian aviation, "not only infra but also that weaker sister, private flying, which will become strong again only when we advance enough in design to be more useful."

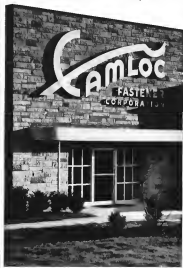
On looking back at CAA/CAB activities in recent years, Mr. Lanning wondered "whether this branch of government has brought its better in the right place."

"It has done well, of course, in many areas," he said. "But how necessary is it for the government to take such detailed specifications on new aircraft for approval? Nothing like this is done in automobiles. . . . To be sure, in earlier days there may have been a value to detailed government supervision. And in the operational field of aviation CAA has done a magnificent job to assure the public a safer means of travel."

"But in design and development work this 'fips' system itself becomes a definite drag on progress."

"Also, the present system is so costly and time-consuming to the new designer that discouragement is evident by the very few new accepted designs."

CAMLOC EXPANDS PLANT FACILITIES to meet increased demands for production



and serve industry better in its requirements for Quarter-Turn Fasteners and various type Locks. Increased Engineering personnel available to solve special fastening problems.

Main Office and Factory
 32 SPRING VALLEY ROAD
 PARAMOUNT, NEW JERSEY
 TWX WACKESACK NJ 470
 Telephone RA1088 9-4900

West Coast Office
 2410 WILSHIRE BOULEVARD
 LOS ANGELES 34, CALIFORNIA
 TWX LA 401
 Telephone WE408 5-1361

Under One Roof

RESEARCH & DEVELOPMENT
ENGINEERING
TOOL DESIGN
FORGEING
PATTERN SHOP
HEAT TREAT
PLATING
FINISHING
CYLINDRICAL & THREADED GRINDING
GEAR CUTTING & GRINDING
QUALIFICATION TEST LABS, RIGS
FINAL ASSEMBLY DEPTS.



from design to delivery...one planning division...one production control...one inspection system...all lead to one responsibility, the key reason for Vard's reputation of producing finer tolerance work on time. This spells dependable performance for YOU!

Vard

PASADENA, CALIFORNIA

Designers and manufacturers of:
NAIL BODY MACHINES
GUN ASSEMBLIES
RACCOON HERRINGBONE ASSEMBLIES
PACQUING R.F. BUSHES
HOLE DRILL WORK AND VORN CASES

purchase. That freedom is given to provide the flexibility and latitude needed in present-day national defense activities. The new road, however, assumes to ensure favorable price and adequate service to the government. To the degree that contractors have been dominated, direction, responsibility upon the defense establishment has been increased. There is the danger that the national drive for freedom and speed in procurement will lead to extreme price levels of contracts by negotiation, and under existing laws, large contracts, and their cost to society. For that reason, I am asking you to specify detailed standards to guide your procurement officials concerning the percentage of business with small companies and the circumstances under which they may waive the general policy of advertising for bids. It is of great importance in procurement matters to establish standards and guidelines to guide all personnel who have authority to place contracts. Different standards in advertisement and policies may result in unequal treatment and give rise to doubts about the wisdom of this new procurement system."

The president's graphic explanation that the new legislation would "lead to excessive placement of contracts by negotiation" was not unfounded. Today, the government is negotiating not only for engines and engines, but also for cars and bulbs and thousands of similar items which are completely standardized and already suitable for public competition. The production that existed during World War II has multiple negotiation does not need more.

Although President Truman has declared a state of emergency, industry is still essentially on a peacetime basis and there is no serious competition for defense contracts.

Procurement of cars and bulbs and other highly competitive standardized items by negotiation represents a corruption of the original intent of Federal Law 417. This law was never intended to allow flexibility in the procurement of large items of equipment, when the nature of the equipment itself or the production of the same and where it is that necessary to maintain a contract was to come to terms on price, delivery, and other contract requirements.

Actually, there is no negotiation involved whatever in at least 91% of the so-called procurement by negotiation.

The average business man, having submitted a proposal on a negotiation usually sits back and expects to be called in for "negotiation." This he interprets as sitting around a conference table and laughing about details, and eventually winding up with a contract. Except for airplanes and other high-value items, this rarely happens. The proposals are evaluated on the basis of low price delivery, fastest financing, and other considerations such as the same is awarded in very much the same fashion without a single word of "negotiation."

The only saving difference involved are that a proposal on a negotiation is given a cost breakdown of the item whereas this is not required on an advertised bid.

Furthermore, negotiated proposals are not opened and read publicly as are advertised bids, and it is impossible to find out how you stand in the competitive bid after a

Vibration Engineering that solves your problems

PROBLEM: To achieve a high degree of vibration isolation in high power engines.

SOLUTION: NE Federal Aircraft Motors.



It's the flexible mounting...the soft structural connection between engine and airframe...that absorbs engine and propeller vibration. Properly designed they eliminate a great source of discomfort and protect the aircraft structure, maintain and extend life.

The MB Type 2000 Mount is designed to absorb vibration of a properly designed mount. Service crew is notified by performance and checked. Some specific job will be done. An absorption unit, it also can be used to absorb power engines. These mounts are used for aircraft and replacement installations on Pratt and Whitney engines.

Remember - NE products are available in 1000 psi on all phases of vibration problems...including static loads, dynamic, measurement and control. That's why so many companies make NE their headquarters for vibration engineering.

For more information, write to NE, 1000 psi on all phases of vibration problems...including static loads, dynamic, measurement and control. That's why so many companies make NE their headquarters for vibration engineering.



THE MB MANUFACTURING COMPANY, INC.
1000 psi on all phases of vibration problems...including static loads, dynamic, measurement and control. That's why so many companies make NE their headquarters for vibration engineering.

to the
ELECTRICAL ENGINEER
or
PHYSICIST
with experience in
RADAR
or
ELECTRONICS

Hughes Research and Development Laboratories, one of the nation's leading electronic organizations, are now seeking a number of new engineers in an expansion phase of their operations.

Here is what one of these positions offers you:

THE COMPANY

Hughes Research and Development Laboratories, located in Southern California, are presently engaged in the development and production of advanced radar systems, electronic computers and guided missiles.

THE NEW EXPERIENCE

The problems we face are those which will serve as technical advisors on government agencies and companies producing Hughes equipment—also a technical conference with customers of other companies working on associated equipment. Some specific job will be done. An absorption unit, it also can be used to absorb power engines. These mounts are used for aircraft and replacement installations on Pratt and Whitney engines.

THE TRAINING

On joining our organization, you will work in the Laboratories for several months to become thoroughly familiar with the equipment which you will later help others to understand and properly employ. If you have already had radar or electronic experience, you will find this knowledge helpful in your new work.

WHERE YOU WORK

After your period of training at full pay—you may (1) remain with the Laboratories in Southern California in an attractive air-conditioned environment, or (2) become the Hughes representative at the company where our equipment is being installed or (3) be the

Hughes representative at a military base in this country or overseas (single and married men keep their families with them at all times).

YOUR FUTURE

In one of three positions you will gain a broad experience which will increase your value to our organization as a future engineer in the field of electronics. The next few years are destined to be large-scale commercial employment of electronic systems. Your training in and familiarity with the most advanced electronic techniques will qualify you for even greater responsibility in future positions.

How to apply:

HUGHES

RESEARCH AND DEVELOPMENT LABORATORIES
Engineering Personnel Department
Culver City,
Los Angeles County, California

If you are under thirty-five years of age, and if you have an B.S. in Physics degree, write to the Laboratories, giving record of your experience. A resume is required that references of the applicant will not cause disclosure of an unclassified project.

NOW YOU CAN



HAVE BOTH!

**INSTANT TRANSMISSION AND RECEPTION ON
360 CRYSTAL CONTROLLED CHANNELS WITH
THE NEW BENDIX VHF RECEIVER...COMPAN-
ION TO THE FAMOUS TA-18BB TRANSMITTER.**

New Bendix — and only Bendix gives complete VHF radio communication. Receiving and transmitting can be controlled from a single control panel. No more confusing channel letters — no more conversion charts.

You don't have to crank it. You don't have to tune or fiddle with it. You just select any one of the 360 frequencies you want and there you are. Send or receive.

Light as a feather

Equipment wise, the new Bendix RA18 is light as a feather. Here in one compact unit, complete with power supply ... it weighs only 18 pounds!

50 KC Channel Spacing

Another Bendix exclusive. Fifty KC channel spacing provides the maximum number of channels available. Eliminates possibility of obsolescence for years to come.

Write for further information

When writing ... ask about the new Bendix companion transmitter and receiver. The transmitter is the TA18. The receiver is the RA18. Write today.



Bendix Aviation Radio



ESSENTIAL TO AIRCRAFT PRODUCTION

figure accuracy
through

Printed Tape Proof

with the
Remington Rand

PRINTING CALCULATOR

Whether you're figuring wing stress or maximum speed, parts inventory or cost analysis, the Remington Rand Printing Calculator saves you a quick, easy and accurate way to get the figures you need. Really two machines in one, it serves equally well as a calculator and as an adding machine. Automatic division and short-cut multiplication, plus rapid addition and subtraction, will give you more work in less time while the 10-key keyboard makes touch operation easy and natural.

The tape on the Remington Rand Printing Calculator is positive proof of figure accuracy... allows you to check every problem, each step of the way... lets you see that your figures are always correct.

For more facts about the Printing Calculator, write to Remington Rand, Room 2574, 315 Fourth Avenue, New York 10, New York.

Remington Rand



ALLEN AIRCRAFT for Dependability



DROP TANK VALVE
Sealing or Non-Sealing



OXYGEN COUPLER
AN 409-2A or 1E



PRESSURE RELIEF VALVE
Line Mounted



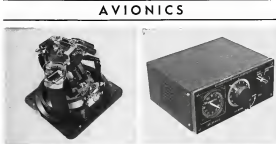
SELF-LOCKING DRAIN VALVE
Straight or Pipe Threads

Allen offers complete engineering, designing and production facilities for custom engineered fuel system components. Contact us or one of our authorized representatives today with your special requirements and specifications.

EAST: W. H. Hulse & J. A. Research
Long Island City 1, N. Y.
WEST: CQ-24, The Thomas Co.
Los Angeles, Calif.

SOUTHWEST: Allen Industries
P. O. Box 1000, Tulsa, Okla.
MICHIGAN: Tied House
Riverside, Calif. & Detroit, Mich.

Allen Aircraft
Products, Inc.
P. O. Box 79, Evanston, Illinois
Phone 7533



FORAS PATH low-drift directional gyro with cover removed shows simplicity of design. The gyro is synchronized by...

SMALL CONTROL PANEL is a master direction indicator. The panel also controls low-drift error in the gyro.

New Gyro Simplifies Polar Navigation

Ellipse-Pioneer 'Polar Path' high-accuracy unit proves itself in SAS DC-6B trans-Arctic flight.

By Philip Klass

A new low-drift, high-accuracy directional gyro, developed by Ellipse-Pioneer, recently proved itself as extremely useful device for polar navigation during the first trans-Arctic flight of South American Airlines System from California to Copenhagen and during the second flight to Oslo.

Soon after the SAS DC-6B grand Wainwright radio beacon on the Ellesmere Sea to Thule leg of the maiden flight, the Ellipse-Pioneer (magnetic) compass needle began to oscillate. The flight was still 1,000 miles away from the North Magnetic Pole, and Navigator Peterson had planned on using the compass to within 100 miles of the pole.

For an accurate heading indication, independent of magnetic interference, Peterson switched in the new E.P. directional gyro, appropriately called "Polar Path." Peterson's flight records introduced gyro log showed that magnetic gyro drift was negligible.

E.P. says the gyro was expected to show maximum drift rates of one degree per hour, or less, compared to rates of five to eight degrees per hour for conventional panel gyros.

Needle confusion? The gyro's magnetic field which has potential as an

old magnetized reference, is fast losing its usefulness, in the military extend, and the commercial airlines began experiments in the region of the North Magnetic Pole. The humankind proved compass needle, which tries to align itself with the horizontal component of the earth's field, becomes hopelessly confused in the region of the magnetic poles where the lines of magnetic force converge. (North and South Magnetic Poles are located approximately 71 and 75 deg north and south latitude, respectively.)

The problem is fundamental and not to the simple compass and in the E.P. Polar Path Compass is compass element magnetically stabilized in a vertical gyro, but it uses equal force with a compass-driven directional gyro. (The latter is a patent development in which the directional gyro is electrically coupled to a remote compass element to maintain the gyro continuously aligned to magnetic north and thus to prevent gyro drift or wander.)

E.P. Polar Path-E.P. has integrated the new low drift DG into its standard Flex-Gate Compass system, thereby providing a heading indicating system for use at all latitudes.

At lower latitudes, the Flex-Gate magnetic compass provides the heading, in accordance presented to the pilot and/or

navigator on a standard two-needle Master Direction Indicator (MDI).

Now the magnetic poles the risk of a switch substitutes the Polar Path DG for the Flex-Gate compass, preventing heading on the same MDI.

The Polar Path controlled MDI provided the same low-drift heading information as the Ellipse-Pioneer PB 33 sub-panel which the SAS pilot reported, and during practically all of both SAS trans-Arctic flights.

In addition to the Polar Path DG, which weighs about 7 lb., a small remote controlling control box weighing about 1 lb. is used. Before reaching the MDI from the Flex-Gate to the Polar Path, the navigator adjusts a small calibrated knob on the remote-control control box until an accurate heading is indicated on the reading of the MDI on the navigator's panel.

E.P. says that this synchronization may be performed automatically, but would add the complexity of an additional small gyro system.

The synchronization knob is also used to set or correction manually for the digital gyro drift (as established by when in radio devices anyone checked) and to correct for "apparent drift" due to earth's rotation.

Map Problem—Conventional Mercator projection charts which employ Great Circle (shortest route) navigation at several latitudes are of little use in the polar region where meridians of



E-F Fielded E-F through-pass with new gyro damped up by SAW circuit

longevity, into the system, and SAG, who the problem was using "good navigators," in which a grid chart is squared off from the meridian of Greenwich.

This makes it possible to fit a Great Circle path route to draw a constant grid heading, eliminating the need for making a series of course corrections. A DG, such as Polar Path, which does not

allow a magnetic compass, will maintain a constant grid for spatial heading except for drift errors. This reworking control line is used to set the Polar Path to the desired grid heading.

► **A Word About "Drift"**—A gyro's own down precession or drift rate is determined by such design and construction details as bearing friction, gyro magnet

orientation, balance, etc. This drift rate is a significant measure of gyro merit and should not be confused with apparent drift caused by the 15 deg. per hour rotation of the earth. Earth's rotation results in an "apparent gyro drift" of 15 deg./hr when the gyro is at the equator North or South Pole, decreasing to the rate of latitude to zero at the equator. Compensation for this effect may be accomplished by acting up a gyro drift in the opposite direction.

If complexity is no limitation, the gyro can be designed so that the magnet field of the "constant drift" is constantly controlled by the navigator as a function of his airplane's latitude.

If the gyro is to be used within a narrow range of latitudes, a simpler solution is to set its fixed average rate governing drift. This is the technique used in the new E-F gyro.

► **No Federal Dependence—Edgemoor-Pencer** has achieved at better than five-to-one reduction in random drift rate by careful attention to design and manufacturing details rather than by resorting to indiscriminately new gyro principles.

For competitive reasons, Horv. Koar, head of E-F's gyro section, is disappointed about details, but he attributes the improved accuracy to the following: ► **Highly-elastic gyro rotor made of a**

material more than twice as dense as steel (unannealed gyro rotor material) gives the Polar Path an angular acceleration several times greater than conventional monometallic gyros.

► **New precision bearings** developed under E-F sponsorship for use in the gyro rotor and main gyro control section (rotation and vibration losses).

► **Low-expansion alloy** in steel cylinders in the gyro to prevent binding as materials in constant operating temperatures.

► **Gyro motor enclosure** acts as a vacuum flask.

Much of the gyro accuracy comes from the extremely high precision manufacturing and assembly techniques used at Edgemoor-Pencer. For example, E-F not only assembles the gyro in an air conditioned, humidity-controlled room (as in some other gyro manufacturers), but it performs most gyro frame, gimbal and motor balancing operations on machine beds located in a similar air conditioned zone. If critical machining operations were not performed under these controlled environmental conditions, E-F says it couldn't build its Polar Path to its present accuracy.

The gyro rotor is turned by a 3-phase, 115-v, 400-cps induction motor, giving the rotor a speed of about 23,000 rpm.

One example of the precision to which E-F works at the bearing and load put on the gyro motor bearings. The axial play of the gyro motor is adjusted to seven-thirtieths of an inch, plus or minus a couple of hundredths. If the axial play were less, the motor would tend to bind, slowing it down; if the axial play were greater, it would allow the rotor to shift position sufficient to unbalance the gyro and cause drift.

► **Military Dependence—Edgemoor-Pencer** is proud that it delivered its first Polar Path DG for the SAG DG-68 only six weeks after it received the order. This performance was possible only because of new bearing design, completely low-drift, quad-mounted gyros (designated the C-58) for the USAF.

Starting with a C-58, old came the T-10, dual pointing, at its place was a gyro for instrumenting the Polar Path's heading to the MDL. Solids because of availability, E-F based the Polar Path in an oriented case used for a standard line of control gyros. (The case is filled with silver and sealed.) E-F even managed to squeeze several flight tests into the 6 week interval.

Conventional DGs compensate in the order of leading the DG spin axis to the gyro case. This is unnecessary for accurate speed work of three times as level flight where the gyro case is steady level.

However, the C-58 is a high-accuracy DG used on fighters which spend considerable time at steep flight angles. For this reason the C-58 must be leveled to the horizontal rather than to the gyro case.

A true pendulum in the C-58 establishes vertical and operates through sub-miniature theodolite vacuum tubes to govern a torque motor which keeps the gyro spin axis level. E-F incorporates

two sets of theodolite in parallel as a safety measure against tube failure, either set of tubes will handle the gyro leveling.

The same C-58 leveling optics is used in the Polar Path but Edgemoor-Pencer glues to eliminate all tubes in future (production) models of the instrument gyro.

► **Independent Systems—Although** the Polar Path and the Polar Path are integrated into a single system from an operational standpoint, technically the two are independent systems. The Polar Path has its own separate area supply line located in the instrumenting area for operating the MDL. The Polar



says Bell Helicopter Pilot Elton J. Smith about his record one-stop flight of 2217 miles

On September 17, 1952, a Franklin-powered Bell 47D-1 Helicopter broke all world's helicopter records for non-stop duration. Eighteen (18) hours from Ft. Worth to Niagara Falls in 52 hours, 57 minutes. Read what Test Pilot Smith says about the engine performance:

"During my long-distance flight, the Franklin engine performed exactly as outlined in the engineering specifications. Although the engine was not a new one, having been recently overhauled at the Aluminized Motors factory and with eight hours from first start overhauled, it never missed a beat. There was absolutely no malfunction at any time from the engine, spark plugs, fuel pump, oil pump, etc. Fuel consumption was within one half of 1% of specifications."

Another Franklin powered helicopter broke world's records for speed and altitude, and a great longevity at all altitudes being only depend on Power by Franklin.



AIRCOOLED MOTORS, INC. SYRACUSE, N. Y.

FEDERAL

AIRCRAFT WORKS




FIRST IN ALL-METAL

AIRCRAFT SKIS

AVIATION LOOKS TO FEDERAL FOR ALL-METAL SKIS

For 27 years Federal Aircraft Works has been the leading designer, designer and producer of aircraft skis. Federal's skis are "First" in several ways. They are the only skis that are completely skid-proof. They are the only skis that are completely skid-proof. They are the only skis that are completely skid-proof.

Write for FREE circular and full information on your specific ski problems.

EXPORTS TO: U.S. Navy, U.S. Air Force, U.S. Marine Corps, U.S. Coast Guard, U.S. Air Sea and Rescue, RCAF, RCN, RCAF, Dept. of Lands and Forests, Arctic and Antarctic Expeditions, Foreign Governments, Major Commercial Operators.

THE FEDERAL (INC OF CANA) 400-2000 3000 INCL 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000 29000 30000 31000 32000 33000 34000 35000 36000 37000 38000 39000 40000 41000 42000 43000 44000 45000 46000 47000 48000 49000 50000 51000 52000 53000 54000 55000 56000 57000 58000 59000 60000 61000 62000 63000 64000 65000 66000 67000 68000 69000 70000 71000 72000 73000 74000 75000 76000 77000 78000 79000 80000 81000 82000 83000 84000 85000 86000 87000 88000 89000 90000 91000 92000 93000 94000 95000 96000 97000 98000 99000 100000

FEDERAL AIRCRAFT WORKS
2410 N. Milwaukee Drive, Minneapolis, Minnesota

Master Ski Builders Since 1925

FEDERAL (INC OF CANA) 400-2000 3000 INCL 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000 29000 30000 31000 32000 33000 34000 35000 36000 37000 38000 39000 40000 41000 42000 43000 44000 45000 46000 47000 48000 49000 50000 51000 52000 53000 54000 55000 56000 57000 58000 59000 60000 61000 62000 63000 64000 65000 66000 67000 68000 69000 70000 71000 72000 73000 74000 75000 76000 77000 78000 79000 80000 81000 82000 83000 84000 85000 86000 87000 88000 89000 90000 91000 92000 93000 94000 95000 96000 97000 98000 99000 100000

FEDERAL AIRCRAFT WORKS
2410 N. Milwaukee Drive, Minneapolis, Minnesota

Master Ski Builders Since 1925



OHIO ELECTRIC can give you faster service

on rods, bushings, inserts—in fact any type threaded part made to the highest precision tolerances. A large volume supplier to major jet engine and accessory manufacturers, Ohio is tested and equipped to undertake experimental and quantity production of parts manufactured to "specs." Reduce your lead time by turning your problems in precision hardened, ground roll-threaded parts over to Ohio Electric.

Ohio also makes lifting magnets and cranes, structural components, shafts and drive shafts, heavy-duty electric hoists, and mill-making machines.

THE OHIO ELECTRIC MFG. CO.
5000 MAURICE AVENUE • CLEVELAND, OHIO

ohio
ELECTRIC

Gate servo amplifier is used only with the magnetic element.

The one vacuum tube used in the Polar Path servo amplifier will be replaced with a magnetic regulator in future models.

Total system weight of the five three-passes (Polar Gate compass, amplifier, MDU, Polar Path, and synchronizing control) is about 25 lb. If the Polar Path DG could be designed to permit it to operate as a compass-driven DG without requiring its basic accuracy, E-P could cut system weight appreciably. However, if E-P has such plans, it is not talking about them.

10000 FILTER CENTER 60000

▲Annie Soda Better ADF—Automated Radio, Inc. (ARI), has recently acquired a new subcommittee (of its Aeronautics Electronics Engineering Committee) to draw up a specification for an improved automatic direction finder (ADF). Objective of the new spec will be to define characteristics for a smaller, lighter, more reliable ADF. Presently used ADF designs in aid by a wide variety of users. With eye to future jet transports, Annie spec may call for environment ADF keep interests.

►Airframe Composite Build K-1—The USAF's K-1 radar bombing system, developed by Sperry Gyro and later discarded then spring, is now being produced by three other prime contractors when Sperry helped set up. These include: AEC Spark Plug division of General Motors, International Business Machines, and National Cash Register Co.

►GE Builds Tube Choke—A husband engineer from 27 Boston-area electronic manufacturers got first-hand experience on new tube and transistor developments and how best to use them at a recent General Electric vacuum tube symposium (held) in Boston. GE stated the tube choice more than a year ago.

►New Components—

▲Adjustable high-Q capacitor can be adjusted to any ratio between 1 and 35 and is suitable for high-frequency applications. Constructed of silver-plated brass and Pervic glass, manufacturer says unit has a Q of 16,000 at 1 mc (Johnson Mfg. Corp., Boston, N. Y.).

▲Motor oil fence with flexible fence attached to the wire element the wall by no required for field work. Cover of the roll-out, called Flexifence, is made of debris-free ink paper. (Precision Paper Tube Co., 1835 W. Charleston St., Chicago 45, Ill.)

EQUIPMENT

Plexiglas Properties

PROPERTY	MEASUREMENT CONDITIONS	PLEXIGLAS 55	PLEXIGLAS 55 UVA
Formability		Unaltered	Unaltered
Clarity	5% transmission, visible light	92%	92%
Impact strength	1/2 in. B (4" x 1" section, Charpy Unaltered Bar)	48 ft-lb	46 ft-lb
Heat distortion point	21°C (70°F)	107°C (225°F)	90°C (194°F)
Stress relaxation	ASTC test technique	4,000 psi	1,500 psi
Stress corrosion resistance	Outdoor exposure at 3,000 psi, from May 1952	95 days	22 days

Plexiglas Craze-Resistance Raised

Type 55 withstands greater pressures, temperatures than previous formulations; outdoor life extended.

By George L. Christman

Philadelphia—A new type of Plexiglas, in limited production at the Rahco & Hise plant here, has greater resistance to crazing and heat than the company's present, widely used acrylics, Plexiglas 55 and 55U, while retaining their advantages of great clarity, and low weight, light weight, shatter resistance and formability.

The new material, Plexiglas 55, has raised strength at stress up to 4,000 psi while subjected to the action of intense solvent. The leading craze resistance test for present acrylic material is 1,500 psi.

In outdoor stress-cracking tests, at 3,000 psi stress that maximum available, its average resistance has been increased

to 95 days from 22 days resistance for Plexiglas 55.

Heat distortion point has been raised to 216°F from 205°F. Heat was applied at the rate of 3.6°F per minute, at 264 psi.

►Fabrication—Plexiglas 55, described by Rahco as a "modified acrylic," is easily formed into multiple-curved shapes. It handles the same as Plexiglas 55 and 55U except for a difference in connecting characteristics, as users need learn on new techniques at cutting, fabricating and laminating, see change their production equipment. It may be laminated with a polyvinyl butyral substrate.

►No Solvents—While flying at 40,000 ft in clear Plexiglas cockpit can quickly acquire a parallel surface unless

the photo filters out a good part of the radiation. "Clearacrylic," light band which is from 130 to 320 millimicrons in wavelength. Material used is ultra-violet ray absorbent must be compatible with the plastic, colorless and able to absorb a large percentage of the erythral band.

The aircraft's effectiveness when used with either Plexiglas 55 or 55U is indicated in the two charts at the bottom of this page.

They show also light transmission below approximately 330-140 millimicrons. (Plexiglas 55U has a quaternary resin identical to that of Plexiglas 55.)

►What's Using It—Rahco & Hise specifications say that the USAF Materials Laboratory and DuPont have tested Plexiglas 55 and spec have been issued under which the material qualifies. The plastic is being flight at a rate noted in such monolithic and laminated form on military aircraft.

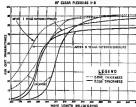
It is being used in production quantities on occasional aircraft—specifically Douglas DC-4s and -64s. Rahco officials add that most major aircraft manufacturers in the country are testing the material.

►Material Material—In spite of the improvements embodied in Plexiglas 55, Rahco & Hise expects to use the plastic only as an interim material. The company's laboratories and technicians are actively engaged in developing plastic materials with even greater resistance to crazing and heat.

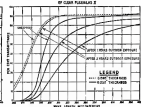
Rahco generally believes any new material develops to at least a one-year outdoor exposure test at stresses it has set up as interim goals of the industry. Their main geographic spread—South, Middle West, East Coast—means exposure to a wide range of climatic conditions. "There is no way of accelerating that," the company says.

Acrylic plastic is still the standard window plastic, according to Rahco & Hise. The company says,

TYPE 55 PLAST TRANSMISSION CHARACTERISTICS OF CLEAR PLEXIGLAS 55



TYPE 55U PLAST TRANSMISSION CHARACTERISTICS OF CLEAR PLEXIGLAS 55





- RESIN APPROVED UNDER U.S.A.F. SPECIFICATIONS
- EASY TO USE
- SIMPLE TO CURE
- OFFERS EXTRA ECONOMIES

Learn How Mobaloy
May Be Used in Your Plant
MAIL COUPON FOR FREE BOOKLET

MOBILE PLASTICS DIVISION
CARLISLE CORPORATION
TELEGRAPH ROAD
MOBILE, ALABAMA

Please send me your free, illustrated booklet on Mobaloy and how it is used in a shrinking plastic.

Company Name _____
Street Address _____
City _____ State _____
Zip _____

THE CROSSROADS OF SOCIAL AND SHOPPING FACILITIES

On your trip to New York



Easy Access to best shopping in New York's busiest heart. Watch cars, excellent view, etc.

The SHERRY NETHERLAND
FIFTH AVE. AT 53RD ST., NEW YORK
Sno Shikels, Printer



Certainly no longer than a hole in the wall, but we're small enough to be versatile. We do quite a bit of shopping, serving, assembly and building. Over 100 companies value our engineering help. We save them money. Perhaps we can do the same for you. Ask us. One free quote only. Call: 3400 Park Ave., Cleveland, Ohio

KONIGSLOW

"There is no other glazing material now available that can be formed in the various complicated shapes now required by the aircraft industry that will retain the transparency of optical glass."

• **Design Important**—Company representatives work closely with airplane designers to produce proper mounting design for transparent Plexiglas components.

The ideal mounting, they say, is one in which the Plexiglas "beats" stress should be evenly distributed along the entire periphery of the panel to eliminate or reduce as possible any stress concentrations on the photo.

OFF THE LINE

Inlight, making of lighter aircraft means that planes also don't weigh enough for the pilots to get hungry. So the USAF has developed a miniature electric even which plugs into an outlet on the side of the cockpit. A small can of soup is placed in the oven. The pilot just and quickly heats the soup to proper temperature, but not off the top of the can for the pilot.

Secretary Oswald Industries, Richmond Hill, N. Y., has received a Civil Aeronautics Administration Region 8 item certifying the first to be used in the New York area, according to the item. Civil Aeronautics certifies that the company's overhead powerlines for aircrafts meet CAA standards.



MITHUSALAH PUMPS

Four horsepower, cast-iron, centrifugal pumps are used in three basement-level tanks of the NMA's DC-4 engine oil pumps. The tanks, the main tanks. The steel tank is placed in the pump's cover plate hole and the lower tanks go in the three holes under the steel pumpings. In the center body of the pump, suggested by E. Zimmerman, engine shop parts and materials supervisor. The pump has cost \$4,000 in that year. Formerly the pumps, costing \$240 each, was discarded after 3,000 hours of operation, according to Zimmerman. The tanks are changed every 5,000 hours.

NEW AVIATION PRODUCTS



Bomb Hoist Motor

As search motor with multiple windings for use in driving bomb hoists and similar applications has been placed on the market by U. S. Electrical Motors, Inc.

The unit is a double-rotated, synchronous motor type. Fan blade is directed over heat dissipating fins for maximum cooling. Motor is said to have high torque and rapid acceleration. It is 4004, 1-phase, 2-pole type, delivering 4 hp at 1,750 rpm and 14 hp at 5,250 rpm. Motor for the motor is operated by direct current.

Aircraft Division, U. S. Electrical Motors, Inc., Terminal Annex, Los Angeles 54, Calif.



Camera Recorder

Type V-10 Photographic Recorder Camera is a remotely controlled 15 mm still camera of continuous operation at 16 frames per second in automatic operation at pre-selected intervals. Its function is to provide a photographic record of instrument readings, status of mechanical components or performance of a complete test such as an airplane landing or takeoff.

It is designed for use in flight test.



Which part interests YOU?..

Perhaps that's one question that rightfully belongs with your future planning.

For, like ourselves, your manufacturing divisions may be talking night and day in the interests of America's safety.

But to research scientists—seeking the solution to some intricate problem of instrumentation and control—Kollsman offers an experienced hand. A reputation based on inventive ingenuity, precision craftsmanship and world-wide acceptance of its products.

In manufacture or research, there is no finer name than Kollsman—designers, developers and makers of:

Aircraft Instruments and Controls
Miniature AC Motors for Indicating and Remote Control Applications
Optical Parts and Optical Devices • Radio Communications and Navigation Equipment



KOLLSMAN INSTRUMENT CORPORATION
GLENDALE, NEW YORK REDWOOD, CALIFORNIA

Standard
SUBSIDIARIES OF
COIL PRODUCTS CO. INC.

LEWIS

Resistance Bulbs

for Aircraft

FOR FAST RESULTS USE THESE ACCURATE, RESPONSIVE, STURDY THERMISTOR-SENSING ELEMENTS WITH LEWIS RESISTANCE-TYPE THERMOMETERS.



Flexible bulbs in standard for fast mounting with this wing carrier.

AM500-A and AM500-B standard type with 100-110 ohm resistance, temperature range -50°F to 180°F, altitude range 0 to 85,000 ft., accuracy to 95%, power required 5 wps at 12 to 24 v. d.c. Remote control and power circuits under the canopy through a standard AN connector located on the rear face of the unit.

The V-10 is not a modified common picture camera, its design says it is a new design based on more than 20 years of experience in the application and operation of photographic cameras for flight test programs.

The V-10 camera weighs 11 lb. and occupies 700 cu. in. Leica-type is developed to withstand severe conditions. Temperature range is from -50°F to 180°F, altitude range 0 to 85,000 ft., accuracy to 95%, power required 5 wps at 12 to 24 v. d.c. Remote control and power circuits under the canopy through a standard AN connector located on the rear face of the unit.

The V-10 is not a modified common picture camera, its design says it is a new design based on more than 20 years of experience in the application and operation of photographic cameras for flight test programs.

THE LEWIS ENGINEERING CO.
Manufacturers of Complete Temperature Measuring Systems for Aircraft
HARTFORD, CONNECTICUT

programs, in guided missiles, in testing laboratories—wherever data can be recorded photographically.

The V-10 camera weighs 11 lb. and occupies 700 cu. in. Leica-type is developed to withstand severe conditions. Temperature range is from -50°F to 180°F, altitude range 0 to 85,000 ft., accuracy to 95%, power required 5 wps at 12 to 24 v. d.c. Remote control and power circuits under the canopy through a standard AN connector located on the rear face of the unit.

The V-10 is not a modified common picture camera, its design says it is a new design based on more than 20 years of experience in the application and operation of photographic cameras for flight test programs.

The V-10 camera weighs 11 lb. and occupies 700 cu. in. Leica-type is developed to withstand severe conditions. Temperature range is from -50°F to 180°F, altitude range 0 to 85,000 ft., accuracy to 95%, power required 5 wps at 12 to 24 v. d.c. Remote control and power circuits under the canopy through a standard AN connector located on the rear face of the unit.

The V-10 camera weighs 11 lb. and occupies 700 cu. in. Leica-type is developed to withstand severe conditions. Temperature range is from -50°F to 180°F, altitude range 0 to 85,000 ft., accuracy to 95%, power required 5 wps at 12 to 24 v. d.c. Remote control and power circuits under the canopy through a standard AN connector located on the rear face of the unit.

The V-10 camera weighs 11 lb. and occupies 700 cu. in. Leica-type is developed to withstand severe conditions. Temperature range is from -50°F to 180°F, altitude range 0 to 85,000 ft., accuracy to 95%, power required 5 wps at 12 to 24 v. d.c. Remote control and power circuits under the canopy through a standard AN connector located on the rear face of the unit.



PASTUSHIN TANKS KEEP COMING!

New ranking of Pastushin America's production line are gleaming aluminum jettable fuel tanks for American's fighting aircraft—Lockheed P-80, Republic P-84, North American P-56, Northrop P-89.

AIRCRAFT FUEL TANKS • SEATS • LANDING FLAPS
AIRBORNE • TAIL SURFACES • BOMB BAY DOORS



PASTUSHIN AVIATION CORPORATION
840 West Century Boulevard • Los Angeles 45, California
LOS ANGELES INTERNATIONAL AIRPORT, LOS ANGELES, CALIFORNIA



4-0-4 Flap Valve

A pressure relief valve for aircraft, which is said to have "survived important military tests," has been put into production by Tarter Mfg. Co.

The valve is a cartridge type, designed to be insensitive to system or back pressure. The seat is being used in the Martin 4-0-4 and helps make possible the self-positioning wing flap system in that craft.

So that flaps may position smoothly and automatically according to a predetermined schedule during takeoff and approach, the relief valve, located in the flap down line, maintains a constant inlet pressure with maximum fluctuation over a wide range of flow and pressure conditions in the system.

The new valve is a modification of another Tarter unit built to MIL-A-1521 specifications and used by a large number of aircraft and engine firms. Hydraulic Division, Tarter Mfg. Co., Farmington, R. I.

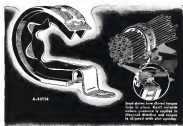
ALSO ON THE MARKET

Universal joints with thrust to right (as transmitting in ball sockets) permit flexible operation at any angle up to 95 deg under load at 5,000 rpm. They are claimed to be more efficient than other ball joints, having several pins working instead of one shaft. Fine View Co., 1181 N. Monroe, Peoria, Ill.

Metall cleaning tank, designed for a wide range of metal operations, combines high-pressure degreasing, washing, stripping and cleaning in one automatic cycle. Equipment can be used also for descaling, pickling, high-pressure rinsing, radiopene and maintenance other metals. J. P. Mfg. Co., 193 E. First St., Youngstown, Ohio.

Military vehicles, made to MIL-4-6745 and Air Force New Standard Drawing AN822, are available in STST and SPDT versions with maintenance or emergency contact, from Acme-Hart & Elgerton Electric Co., 103 Hawthorn St., Hartford 6, Conn.

NEW TINNEMAN HARNESS CLAMP with Safe Interlocking Tongue and Slot



CAN'T SPRING OPEN ACCIDENTALLY... YET OPENS EASILY FOR SERVICING!

Here's the most efficient successor to the old quick-opening type of harness clamp! Aircraft designers and engineers will welcome the advantages offered by the new AS0114 Tinnerman clamp. Check this list...

1. High safety factor—load over 300 lbs.
2. Can be preassembled to wire bundle before fastening to structure.
3. Opens and closes by hand—no tools required
4. Light weight—port simple.
5. Used with synthetic rubber for wire protection and insulation.
6. Range of 10 sizes—from 1/2" diameter to 1 1/2" diameter handle.

Write today for additional specifications: Tinnerman Products, Inc., Dept. 12, Box 6089, Cleveland 1, Ohio. Distributor: Air Associates, Inc., Teaneck, New Jersey.

TINNEMAN
Speed Nuts®

PATENTED IN 47 COUNTRIES

signed and manufactured by the de Havilland Engine Co. Ltd. They were installed on G-ALYZ on Sept. 9, 1952 and at the time of the accident the approximate running time of each was 19 hours. Apart from the normal routine servicing checks, the only replacements had been an indicator pump and the spark plug of the reformed center engine on Oct. 15, 1952.

- (vi) **Operational Limitations**
- **Weight**—The maximum permitted all-up (gross) weight is 105,000 lb. (47,627 kg) and the maximum permitted landing weight is 75,000 lb. (34,019 kg).
- **Center of Gravity**—When the total loaded weight is greater than 71,000 lb., the forward limit varies linearly with increase in weight from 8.993 ft. to 9.035 ft. forward of the datum with the landing gear extended.

The air lift is 0.015 ft. aft of the datum with the landing gear extended.

- **Datum**—The datum is defined by two planes located on the lower rib of the center section 37.66 ft. aft of the leading wing.
- **ROMC**—Datum—This is 1.65 in. or 0.041 ft. aft of the manufacturers datum.
- **Safe Take-Off**—The order limit is 1,000 kg. It is accurate about the ROMC datum.

- (vii) **Lift Short**
- The aircraft's lift short showed that the total all-up weight at takeoff was 45,927 kg. and that the CG position without fuel was within the Safe Range and was at a position of -11.8 ft. aft of the Safe Range limit which is 0 ft. —24 ft. ROM.
- (NOTE: A CG position within the Safe Range limits is such that the CG remains within the permitted range provided the

approved fuel loading and engine conditions are complied with.)

For the flight the total fuel load at takeoff was 17,575 kg. and it was distributed in accordance with the approved conditions. A reduction of the CG position (including fuel) at the base of the takeoff shows that it was 0.015 ft. aft of the datum (0.005 ft. aft of the ROMC datum).

- (viii) **Pre-Takeoff Computations**
- To determine the expected lift-off weight, the critical speed and the resulting speed, calculations are based on the geographical altitude of the airport, the length of paved runway and its drainage gradient, the current wind component and the airfield wet temperature. In this instance the run parameters were correctly made by the crew and were as follows:
- Scheduled takeoff weight, 46,990 kg.
- Critical speed 105.6 kts.
- Takeoff speed 137 kts. 155.

(b) The Crew

(i) The Captain

Captain R. B. H. Fooks is 36 years of age and a Second Class Senior Captain of the ROMC. He was trained as a pilot by the R.A.F. during the war and after being 14,500 hours as first pilot he was seconded to the ROMC on June 15, 1949, for being duties and appointed as Acting First Officer. He was demobilized from the RAF on Oct. 15, 1946, and on Apr. 8, 1947, was promoted to Junior Captain by the corporation.

Between Jan. 1, 1948 and July 31, 1951, he was employed as an instructor and check pilot in York, Lancaster and Hercules IV aircraft. During the period January-March 1952 he was given ground and flying training in the operation of Comet aircraft. This was followed by course certification training as pilot on the routes U.K. to Singapore (Oct. 15, 1952), May 27, 1952) and U.K. to Johannesburg (July 25, 1952, to Aug. 6, 1953). On completion of this training he was given a ROMC Operations Certificate of Competence as pilot and instructor of Comet aircraft. Meanwhile he had on Aug. 1, 1952, been promoted to Second Class Senior Captain.

He has flown a total of 7,660 hours of which 1,565 have been with the ROMC as lead pilot in multi-engine aircraft.

His experience as Senior Pilot includes 75 hours as first pilot and 174 hours as second pilot of which 35 and 24 hours respectively have been at night.

Captain Fooks holds the following licenses which were valid at the time of the accident:

- (a) **Aviation Transport Pilot's No. 22119** with current instrument rating and Aerobically Endowed for Comet Series II and Hercules IV or Group I, and York and Lancaster in Group II.

- (b) **General Flight Radio-Telephony Operator's No. 407.**

In addition he had in January 1952 passed the technical examination for a Flight New Pilot's License.

He was last medically examined on Sept. 4, 1952, and passed as fit for flying duties.

Captain Fooks had an accident-free record with the ROMC except for one incident on Sept. 16, 1951, at which his aircraft, a Dervaux, lost an obstruction marker. He was held responsible and admonished.

- (c) **First Officer**
- First Officer S. C. Joking is 26 years of

Reverse the Wear...

BASE METAL

PORUS-KROME



VAN DER HORST

* *Porus-Krome is a dense, hard, wear and corrosion-resistant chromium, produced by the Van der Horst Corporation of America, and which gives working surfaces an infinite number of dry oil-retaining reservoirs for perfected lubrication.*

R. L. PATENT
GRANTED, U.S. PAT. AND FOREIGN

The effects of wear on expensive, machined parts—such as aircraft cylinders—can be reversed. By Van der Horst processing, even badly worn cylinders recover their original dimensions. Then, instead of wearing out again in the usual time, they last at least twice as long.

We use channel type PORUS-KROME® to accomplish this reversal. It has been proved and accepted by the armed services, and by air carriers. One of the latter finds the entire cost of each renewal is paid for by reduced lube oil consumption. This special chromium steps up engine efficiency!

Besides that, and a much better resistance to airborne abrasives, the costs of overhaul and spare parts are cut to a minimum. Even the rusting of cylinders—always a major menace of "low time" aircraft engine life—is counteracted by chromium.

One manufacturer now specifies PORUS-KROME cylinders as standard in all new engines—to make them stay new! For equal advantage, have Van der Horst "reverse the wear!"

W-12-56

For Parts that must be TAKEN OFF—PUT BACK—BUTTONED TIGHT LION FASTENERS



LOCKSTIGHT WITH A QUARTER TURN

Always of correct tension

These Fasteners are tight in buttoning joints that must be re-adjusted frequently for irregular maintenance or after repairs. Vibration and shock (and in some cases, fire) cannot loosen a Lion Fastener. Even an impact-resistant screw (not a nut) requires a wrench. A quarter turn opens it. Another quarter turn locks it. The tension is determined by it.

Lion Fastener Spring Assembly is quickly set up without a divider in place. The steel element is bent to its permanent right in the sheet. They will button screws and pins in 1/8" actual time in under standard tension. The sheet-metal is as much as 1/4" thick. The price is low and it is used in 1953 the 70% today for domestic use and applications data.

Free DEMONSTRATION KIT contains sample Lion Fasteners to help you visualize their adaptability to your product. Write to our company for literature. No obligation.



Typical Applications
INSPECTION
FLIGHTS
COWLING
ELECTRICAL
PANELS
CABINETS
DUCTWORK

LION FASTENERS, INC.
490 Main St., Haverhill, Mass., U.S.A.

VAN DER HORST CORPORATION • OLEAN, N. Y.

Cessna Celebrates the "Golden Year of Flying" With Its

Greatest Achievement in Airplanes for Business!



**A SEATHEATRE
FROM
Dwane L. WALLACE**
PRESIDENT, CESSNA AIRCRAFT CO.
About a Fast, Modern, All-
Metal Airplane—Priced for
Small Businesses as well
as Large.

"Cessna's history extends through forty-two of flying's fifty years. And through it all, we have had just one dream . . . OUR AIR . . ."

"... to make flying as safe—as easy—as comfortable and convenient as the business airplane would become as useful and accepted as the business automobile."

"We've made great progress in this. Today, the Cessna 170 is America's largest-selling personal and company airplane and Cessna 170 and 180 Series airplanes are being used by thousands of ordinary

businessmen—not as playthings—but as practical, profitable, everyday business tools.

"Now—for flying's 50th Anniversary—we are ready with the greatest business airplane of them all . . . the new "Golden Year" Cessna 180!"

"While I've been proud of other Cessna airplanes—I'm so proud of this one that I want to emphasize three things about it personally."

"First—speed! We have achieved in a relatively low-

priced airplane a cruising speed of OVER 150 M.P.H.

"Second—PRICE! The new 180 sells for \$12,300 . . . close to ONE-THIRD less than any other make of airplane in the over 150 mph. class!"

"And THIRD—LANDING, TAKE-OFF AND FLYING CHARACTERISTICS! They are outstanding. It's the finest engineered piece of flying equipment ever rolled out of the door here at Cessna. Easy to fly and to operate out of large fields and small!"



ALL-NEW SURVIVORITE—from the exhaust on back to the new "upside" tail design which was selected from Jet engine's. The tail assembly is encased in a crash-resistant structure and featuring "strong" One of the secrets of the "Golden Year" 180's speed and fine flight characteristics is its exceptional construction throughout!



CONTRIBUTE ALL METAL CON-
STANT SPEED PROPELLER . . . 233
hp Continental engine—lets give this
plane a cruising speed of well over
120 mph with a range of 750 miles.

SURVIVORITE GARN with lots of room for four standard
seats—four optional seats with installed light-
ing, blind landing and weathering system . . . for perfect
control at all altitudes, in all weather.

CESSNA "PARAGLIFT" FLAPS—reduce landing
speeds a good 10%—shorten takeoffs. Make
small field landings safe and practical and
Cessna's famous safety landing gear enables
out rough fields.

Also See

**THE "GOLDEN YEAR" CESSNA
170**—America's fastest selling
personal plane. Made new and
better than ever. Improved
altitude, 4 place plane in the
market . . . by several thousand
dollar.

THE CESSNA 170 SERIES, four
place 4 place standard plane.
America's greatest, brightest
business transportation.

Look in the Classified Telephone
book for the name of your nearest
Cessna dealer . . . or write

**CESSNA AIRCRAFT COMPANY
DEPT. AW-1
WICHITA, KANSAS**

New "Golden Year" Cessna 180 over 150 M.P.H. Cruising Speed



**REGULAR, CLOSE TOLERANCE
AND INTERFERENCE FIT TYPES
MANUFACTURED FROM ALLOY
STEEL, STAINLESS STEEL AND
7057 ALUMINUM ALLOY**

Hi-Sham: Kivits of all types—in a full range of sizes are available through Phenix's extensive manufacturing facilities . . .

- MSL 121** 121¹ Count Book
MSL 118 Flat Rolling Stand
MSL 117 Counters 120¹ Counters Book
MSL 116 Count Book
MSL 115 Count Book
MSL 114 Count Book
MSL 113 Count Book
MSL 112 Count Book
MSL 111 Count Book
MSL 110 Count Book
MSL 109 Count Book
MSL 108 Count Book
MSL 107 Count Book
MSL 106 Count Book
MSL 105 Count Book
MSL 104 Count Book
MSL 103 Count Book
MSL 102 Count Book
MSL 101 Count Book
MSL 100 Count Book
MSL 99 Count Book
MSL 98 Count Book
MSL 97 Count Book
MSL 96 Count Book
MSL 95 Count Book
MSL 94 Count Book
MSL 93 Count Book
MSL 92 Count Book
MSL 91 Count Book
MSL 90 Count Book
MSL 89 Count Book
MSL 88 Count Book
MSL 87 Count Book
MSL 86 Count Book
MSL 85 Count Book
MSL 84 Count Book
MSL 83 Count Book
MSL 82 Count Book
MSL 81 Count Book
MSL 80 Count Book
MSL 79 Count Book
MSL 78 Count Book
MSL 77 Count Book
MSL 76 Count Book
MSL 75 Count Book
MSL 74 Count Book
MSL 73 Count Book
MSL 72 Count Book
MSL 71 Count Book
MSL 70 Count Book
MSL 69 Count Book
MSL 68 Count Book
MSL 67 Count Book
MSL 66 Count Book
MSL 65 Count Book
MSL 64 Count Book
MSL 63 Count Book
MSL 62 Count Book
MSL 61 Count Book
MSL 60 Count Book
MSL 59 Count Book
MSL 58 Count Book
MSL 57 Count Book
MSL 56 Count Book
MSL 55 Count Book
MSL 54 Count Book
MSL 53 Count Book
MSL 52 Count Book
MSL 51 Count Book
MSL 50 Count Book
MSL 49 Count Book
MSL 48 Count Book
MSL 47 Count Book
MSL 46 Count Book
MSL 45 Count Book
MSL 44 Count Book
MSL 43 Count Book
MSL 42 Count Book
MSL 41 Count Book
MSL 40 Count Book
MSL 39 Count Book
MSL 38 Count Book
MSL 37 Count Book
MSL 36 Count Book
MSL 35 Count Book
MSL 34 Count Book
MSL 33 Count Book
MSL 32 Count Book
MSL 31 Count Book
MSL 30 Count Book
MSL 29 Count Book
MSL 28 Count Book
MSL 27 Count Book
MSL 26 Count Book
MSL 25 Count Book
MSL 24 Count Book
MSL 23 Count Book
MSL 22 Count Book
MSL 21 Count Book
MSL 20 Count Book
MSL 19 Count Book
MSL 18 Count Book
MSL 17 Count Book
MSL 16 Count Book
MSL 15 Count Book
MSL 14 Count Book
MSL 13 Count Book
MSL 12 Count Book
MSL 11 Count Book
MSL 10 Count Book
MSL 9 Count Book
MSL 8 Count Book
MSL 7 Count Book
MSL 6 Count Book
MSL 5 Count Book
MSL 4 Count Book
MSL 3 Count Book
MSL 2 Count Book
MSL 1 Count Book

THE 30-Kilowatt Silver consists of a hardened pin and a stainless-steel sleeve with a flange. Drilling may be done from either end. A simple magnetic rivet set is fitted to the conventional rivet gun (or is used as part of the bucking bar), or a pneumatic squarer may be employed. As the collar is forced into the groove at the end of the pin, a ring of waste material is pushed off and automatically ejected.

SAJCE and Engineering Data Sheet
Available in French

Time Reducing Features and A-1

- Advantages:**
- Adaptability to high-speed cutting of most large pipe sizes (greater than 60 in. dia.)
 - Quick and positive visual inspection. No guess work as to proper maintenance. Pipes in order stacking, storage not needed.
 - No sharp edges or extensive protrusions. Producing finished ends for use as low and smooth.
 - Weld quality done together. The weld appears on the inside and outside as one drive an instrument only shows the work together — internally — fully.

[illegible]

The two flows a total of 7,271 hours of which 519 have been with the RDA; as first pilot of multiengine aircraft. The total excludes 208 hours by day and 61 hours by night as second pilot on Cessna aircraft.

First Officer Jodig built the following fireman which were used at the time of the accident:

- [10] Arctic Transport Pilot's No. 2835 with current instrument Rating. Instrument Rating for multi-engine land/sea and Airline Ratings for Comet II, Conquest and Tiger Moth in Group I and Viking, Lomaxton and York in Group II.

He was last medically examined on May 6, 1971, and passed fit for flying duties.

First Officer F. K. Hunspley is 35 years of age and was trained as a pilot by the RAF. On Jan. 21, 1948, he was engaged by the BOAC as First Officer. He was posted to the supergigantic Comet First on June 16, 1952, and up to the time of the accident he had flown 27 hours, 19 by day and 8 by night, as second pilot of Comet aircraft. His total flying was 4,536 hours as first and second pilot.

He lists the following items which were sold at the time of the accident:

- (c) General Flight Radio Telephony Operator's No. 105

Engineer Officer S. L. Bolton is 29 years of age and joined the RCAF as a ground

On Apr. 24, 1947, he was transferred to the sea crew section for duty in Third Engineer Officer.

During the period Dec. 17, 1951, to Feb. 11, 1952, he was given technical training as gas turbine engine and the Comet aircraft.

On completion he was assigned as Engr.

was Officer in the type for local flying. On Aug. 14, 1992, he was appointed Executive Officer of Council aircraft after having been

factorily completed barrels (among 14 Apr. 7, 1981; Apr. 12, 1981) over the study U.K. to Bohemian. The two forms a total of 2,000

Endorsements of automotive heater shut-off valves



RADIOGRAPHY



For example, take this automotive heater shut-off valve. Radiographs of pilot castings, made prior to production runs, disclosed a few recurring areas of porosity. A minor change in casting technique brought a higher yield of sound castings.

Cases like this show why more and more progressive suppliers of castings are employing radiography. It leads to sound production quickly, lets them know only high-quality work is released.

If you would like to know how radiography can help you in your operations, discuss it with your x-ray dealer. Or, if you wish, we'll send you a free copy of "Radiography as a Forensic Tool."

EASTMAN KODAK COMPANY
X-ray Division • Rochester 4, New York

Radiography...

another important function
of photography

Kodak
71423 6488

An ever-increasing number of manufacturers, operators and suppliers, with products and services ranging all industry...from Avionics to Rare Metals to Precision Components... have made Aviation, today's No. 1 Market, their No. 1 Market for 1953.

AVIATION WEEK, read and preferred throughout the Industry, salutes its 225 new advertisers for the twelve months of 1952 and bows to its "regulars," who made possible a lineage increase of **707** pages over the same period last year. This represents a 27.6% increase and an over-all record unmatched by any other aeronautical magazine. It also has placed **AVIATION WEEK** Magazine in the ranks of the twenty largest magazines in this country (business and consumer) as based on its total 1952 advertising volume of **3249** pages.

Member ARC-ARP

AVIATION WEEK

McGraw-Hill Publishing Company, Inc., 330 West 42 Street, New York 36, N.Y.

Other advertising sales offices: Atlanta 3, Ga., 1201 Rhodes Bldg. • Boston 16, Mass., 150 Post Square Bldg. • Chicago 11, Ill., 501 N. Michigan Ave. • Cleveland 12, Ohio, 1212 Krohn Bldg. • Dallas 1, Tex., First National Bank Bldg. • Detroit 24, Mich., 426 Renaissance Bldg. • Los Angeles 17, Calif., 1711 Wilshire Blvd. • Pittsburgh 22, Pa., 728 E. Ohio Bldg. • Philadelphia 3, Pa., 176 and Jackson Streets • San Francisco 4, Calif., 45 Post Street • St. Louis 8, Mo., Commercial Bldg. • London, E.C. 4, England, 52 Pall Mall St.

known with the BOMC as Engine Office of which 175 hours have been in Canada.

Mr. Bolger holds a valid Flight Engineer's License No. 159, endorsed for Canada 1 and Bremen airtask.

(c) Supervisory Engineer Office
Engine Office F. G. Bolger is 34 years of age and passed the BOMC as a general engineer on Apr. 24, 1946.

On July 7, 1952, he was transferred to the corporation's Coast fleet for training as an engine engine office.

He received Flight Engineer's License (Color Class) No. 499 endorsed for jet turbine powered aircraft.

(d) Radio Office
Radio Officer F. G. Bolger is 34 years of age and passed the BOMC on Jan. 1, 1946. He holds Certificate of Competence (R/T and R/T) No. 2478 and First Class Flight Radio Telephone License No. 1203 which was valid at the time of the accident. He has been a total of 2,695 hours as Radio Officer of which 180 were in Canada.

(e) The Weather

Weather conditions prevailing at the time of the accident were recorded by the Illinois Meteorological Office at Chicago Airport as follows:

- Weather: Continuous light rain. Vfr 10 to 15.
- Wind: 250° 10 to 15.
- Cloud: 5/10 500 ft. 4000 meters.
- Dew: 1800 ft. 100 ft. and at runway 100 ft. 900 ft. and at runway 100 ft.
- Visibility: 1000 ft. and at runway 100 ft.
- Temperature: 50°.
- Dew point: 18°.

(f) Chicago Airport

The runway is 430 ft. long.

Runway 36 is unobstructed and has an asphalt gradient of 1.10%; it is 150 ft. wide and 7,250 ft. long with no curves. When visible runway lights 271 ft. above ground level are installed along both sides of the runway.

(g) The Flight

The Coast scheduled passage starting to Indianapolis is made via Rome and Cairo. Flight No. 117418 departed from London Airport on Oct. 26, 1952, at 1955 hr. and arrived at Chicago Airport at 1817 hr. The total flight time was 4:40 hr. The flight was made without incident and no entry in the "Technical Log" of "No defects" was made by the Captain.

At Rome, four of the passengers disembarked and five passed the BOMC and the total traffic load for the flight to Cairo was 4,700 kg. The aircraft was checked to a capacity of 17,875 lb. and a Derringer Clark crash, there were no defects. On completion of the traffic and control procedures the engine was started and fuel discharge and an unobstructed road opened and direction was given by Flying Control. The aircraft was taken to Runway 16 and lined up on the center line, all preflight checks were made and the elevator, aileron and rudder were set at the neutral position. The Captain's evaluation of engine reliability was 5 miles but with no horizon.

The legs were lowered to 15° and the windscreen wipers were both operating. The engine was opened up to full power and

AHEAD OF THE VAPOR TRAIL...



THAT streak in the sky is a Carver Wright Supersonic J-69 Turbo Jet Engine powering a high-speed plane. The intense heat—approximately 1500° F.—developed during flight is enough to disintegrate "normal" materials, formed in the usual way. Yet in this inferno of power Lebanon Castings' Steel-Castings Castings of special heat-resistant alloys are giving dependable service as...

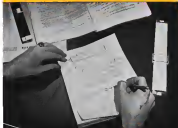
TURBINE SHROUDS
HEAT SHIELD SUPPORTS
EXHAUST CONE FLANGES
COMBUSTION CHAMBER FLANGES
TURBINE BLADE SPACER RINGS

"CENTRALITE", patented name for method of casting steel centrifugally in metal molds, makes feasible investment with First-Product Stainless Steel. Limited, Sheffield, England. Lebanon also makes steel castings both static and centrifugal, as required.

Have you seen...
STEEL WITH A
THOUSAND QUALITIES?
This 37 mm., 16 mm., ball-bearing steel, showing steel castings from this plant, used in the aircraft, should be shown to your organization for information. See Dept. E, Lebanon Steel Foundry, Lebanon, Pa.

LEBANON Castings
CARBON, SPECIAL ALLOY
AND STAINLESS STEEL
LEBANON STEEL FOUNDRY
LEBANON, PA.

ENGINEERS



DON'T MISS THIS OPPORTUNITY

Utilizing today the advanced technological skills of many engineers, Convair's expanding facilities in the fields of mechanical, structural, and manufacturing sciences, exceptional opportunities exist for experienced top engineers as well as young engineering graduates. If you are looking for an engineering job with a future, mail the coupon below. If accepted, your interest and resume will be put in our files where our selection experts have little difficulty in finding suitable openings.

At Convair you'll enjoy these benefits • Field vacancies • Paid holidays yearly • Group insurance including hospitalization for employees and families • Opportunity for "on plant" graduate and college graduate study • Mail sending conditions in air-conditioned plant • Excellent advancement opportunities.

CONVAIR NEEDS YOUR TALENTS TO EFFECT FORTRESS'S AIRCRAFT

CONVAIR

CONVENTED VALTE AIRCRAFT CORP.
25th St. 1st Fl. (Opp. Postoffice) 2070 St. 1st
PO Box 1000, Littleton, CO 80120

As an engineer available for employment now in the air force, I am interested in the new position at Convair. Send me additional information.

My line of engineering is _____

MY NAME _____

MY ADDRESS _____

MY CITY _____ STATE _____

IN THESE FIELDS:

DESIGN

DYNAMICS

STRUCTURES

PROPULSION

AERODYNAMICS

NUCLEAR PHYSICS

THERMODYNAMICS

WEIGHTS CONTROL

SERVO MECHANISMS

APPLIED MECHANICS

AUTOMATIC CONTROLS

REACTION ENGINEERING

ELECTRONICS SYSTEMS

OPERATIONS ANALYSIS

the location switches were set to "Isolate." The rpm were checked at 10,240 in all engines, fuel flow, engine temperatures and pressures were recorded in the cockpit. The engines were advanced and the aircraft made a normal departure. At an AAS of 79-80 kt, the nose wheel was lifted from the runway and a slight tendency to swing to starboard was corrected.

At an AAS of 112 kt, the Captain lifted the aircraft from the ground for a positive backward movement of the control column and when he confirmed that the aircraft had reached a safe height he called for "undercarriage up." At about the same time the post wing dropped and starboard velocity and the aircraft swung to port, the controls gave normal response and lateral level was regained. At this point the Captain called that the aircraft speed was not building up, although he made no reference to the AAS. A powerplant problem and shortly was left which he corrected with the coast of a stall and in spite of two crewmember uncertainty of vehicle status the engine restarted. Before the First Officer had time to select undercarriage up, the aircraft came down on its own landing wheels and landed.

It was now plainly evident to the Captain that the aircraft's speed was not increasing and he was convinced that there was a considerable loss of engine thrust. The wing also swung that the aircraft was rapidly approaching the end of the runway and a decrease to starboard the aircraft was made. The undercarriage struck a second of south as he was clearing the finalizer and the aircraft did not come 170 kt over single ground. The main undercarriage was torn out of and considerable damage resulted, a large spillage of fuel occurred but the fuel did not break out. One passenger suffered slight shock and another sustained a cut finger.

Subsequent investigation of the crew confirmed that all engines had given their maximum thrust and that fuel flows, temperatures and pressures had all been normal during the incident. It was the belief of the First Officer that the nose wheel was lifted from the ground in the level manner although the control column appeared to be "a few feet back." He also thought that the "smoke" was made in moving the control ball away from the normal position and that it was held there until the post wing dropped. He also stated that he was unable to determine aircraft attitude after the bounce as no recovery lights were visible to him.

Due to darkness and due also to the rain no ground witness had a clear view of the aircraft. Clearly, when observed at the time a point opposite the half way position of the runway, considered that the aircraft's attitude was "critical" as it passed him. He continued to observe it as the nose was considerably high and he was not aware that the aircraft was airborne.

(B) Incidents of Weather
The incident took place on the date of the wreckage is shown in Appendix E.

An inspection conducted at the scene of the wreckage showed that the aircraft was about 170 yards from the opened end of runway 16 and was 10 ft from the boundary fence; considerable damage had resulted. A large spillage of fuel from the post wing integral tanks had occurred but

SEVERAL TYPES OF.....

TEST EQUIPMENT

.....TO KEEP JETS FLYING!

MULTIPURPOSE HYDRAULIC TEST STAND

Used to check the efficiency of such items as hydraulic pumps, aircraft pressure regulators, valves and fittings. Unit is furnished with variable speed drive and pot and several different complete hydraulic circuits to provide a very flexible design. Unit includes pressure and vacuum tanks, control high and low pressure pump circuits and a large electric test unit with built-in test of various. Complete interchangeability of valves and pumping circuits make this a universal test stand.



BLEEDING STAND

A means of slushing and purging the internal working parts of control gas turbines after final start and before departure. Unit includes complete pumping circuit and heated storage tank for slushing and purging oils.



SUPERCHARGER LINE PUMP TEST STAND

Used to measure and check output of turbocharging oil service and scavenger pumps. Pump is mounted on test pot (optional design available) and vacuum and discharge are subjected to pressure and temperature simulating actual operating conditions. Variable speed drive 0 RPM to 1000 RPM (or greater) is furnished in either hydraulic or electric design.



LEAK CHECK STAND

Used to detect any leaks in piping systems in jet engines. The engine is mounted at a power driven rotary stand furnished with this unit and connected to the Leak Check Stand. The unit is then rotated — simulating operating conditions and each piping section on the engine checked for pressure drop, etc., to assure that no leaks have developed in assembly.

In addition to making the well-known
WARREN VHS VACUUM HIGH SPEED TESTING UNIT
for testing parts up to
100,000 rpm
we have engineered and built the test stands shown here ...
all of which are absolutely essential to JET ENGINE production.

WARREN BROTHERS
MANUFACTURING DIVISION
WARREN BROTHERS ROADS COMPANY
22 POTTER STREET • CAMBRIDGE 42 • MASSACHUSETTS

• Write for
• detailed information,
• to Department 126.

• DESIGNING
• ENGINEERING
• MANUFACTURING

The
rubber ball
that
wouldn't
bounce...

There's more to rubber than bounce! Rubber parts, therefore, must be specifically engineered to meet the requirements of their intended applications. In addition to elasticity, many special properties are essential for dependable performance. These include resistance to extreme temperatures or weather conditions, the ability to withstand oils and other petroleum derivatives, resistance to various chemicals, and long life despite abrasive actions encountered in many applications.

STALWART RUBBER specialists can fabricate custom shapes from stocks compounded to meet specific job requirements. These shapes can be molded, extruded, die-cut, lathe-cut or machined-built to meet individual SAE or A.S.T.M. specifications.



We're looking for
CATALOG 3558 I
for complete
information.



STALWART RUBBER COMPANY

200 North Lincoln Street • Chicago, Illinois

for did not break out. Both inertia switches had tripped. The in-cabin switch operating lever functioned correctly and the inertia switches fire extinguisher bottles had discharged.

The seats and their attachments in the crew and passenger compartments were not damaged. The crew's forward entrance door and the passenger entrance door disintegrated normally in also did the emergency latches. The first step in the forward galley of about 11' and this corresponded to that indicated in the wreckage. The elevator, stairs and cabin floor indicators were in the normal position.

Wheel marks on the runway showed that the main landing wheels had been in contact with the runway over the last 30 ft. of its length. The most interest was made in two marks of earth when the aircraft's undercarriage was separated and parts of these marks damaged the telephone part of the radio box was broken in the telephone. The front main main indicators were forward and struck the ILS van with force. The port main plane hit the runway down line indicator which is mounted on the main plane and the wing tip and pilot head was torn off. The standard wing tip study that had become detached at its forward end when the standard bracket marks had detached due to impact forces. The detachment allowed the impact to rotate on its mounting brackets through the main plane then and in a nose down attitude. The nose wheel was forced forward into its housing and the tail boom unit was torn from the rear portion of the fuselage. The longer attachment bracket was also severely damaged in the wreckage trail. An examination of the bracket showed that the wing and bracket was deeply scored.

A size mark along the runway revealed evidence of fuel leakage marks which were in length from 1 ft. to 40 ft. These marks extended along the last 500 yards of the runway and showed that the aircraft's fuel was released a few degrees in standard of the runway center line.

(g) Subsequent Tests

The Captain's and First Officer's stepped indicators and artificial horizon were recovered from the aircraft. They have been checked for operation and found to be within the permitted limits.

■ OBSERVATION

The ROAD Training Model represented the following teleoff technique: "Halt! In, the nose should be lifted until the outside of the nose wheel comes out. Care should be taken not to avoid the end of the wing and the nose wheel should be kept at a constant 4 in. to 6 in. from the ground."

The normal landing sequence during the teleoff ground run is about 15' after the nose wheel has been raised part of the runway. To do this a backward stick movement of about 4 in. is required which is then released to 10 inches.

The attitude of "nose" is approximately 6°-8° and to attain this the rigid stick movement at the time of leaving the ground is of the order of 6 in. back from the neutral position after which the stick must be released towards the permitted position.

Teleoff tests by the manufacturer have shown that a constant 6° incidence of fuselage

FOUR TRANSMITTERS IN ONE



- Accommodates up to four individual R, F, channels in a single unit in the following frequency ranges: 120-525 kc, 2-18 mc, 116-132 mc
- Power output: 500 watts LP and RF, 250 watts VHF.
- Accessibility of channels provides for easy inspection and maintenance.
- Single or simultaneous frequency transmission provides ultimate flexibility.
- Complete remote control operation.

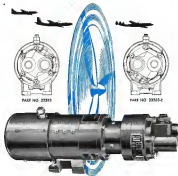


More info
on complete communications

wilcox

ELECTRIC COMPANY, INC.

Pittsburgh and Chicago
Kansas City 27, Missouri, U.S.A.



ADEL PROPELLER FEATHERING PUMPS

TROUBLE-FREE PERFORMANCE

"as specified"

RATED CAPACITY: 375 G.P.M. min. @ 28 N.H.P. B.C. and 170 A.H.P. at 800 R.P.M.
 RATED PRESSURE: 105 ± 25 P.S.I.
 RELAY DRAVE SETTING: 1400 P.S.I. max. with outlet port blocked.
 DUTY CYCLE: 18 seconds on and 18 seconds off.
 AMBIENT TEMPERATURE RANGE: -45° to +110°F.
 MOTOR REMOVAL: One-step shims used for pump and motor.
 WEIGHT: 20 lbs. 8 oz.

NOTE: Various seal-off oils and combinations, such as aircraft hydraulic fluid mixed with aircraft grease etc., etc.
 Major designed to meet customer proof requirements of Specifications MIL-FACTO Section 4-2.
 ADEL Propeller Feathering Pumps meet or surpass all military or Commercial standards to provide safe, dependable prop feathering performance.

ADEL produces a complete line of Aircraft hydraulic & pneumatic control equipment, valves, actuators & fluid system instruments, sensors accessories and spare components.



long during the ground run gives proof to allow the distance run used for check-out behavior. They have also shown that an increase of clearance to 9" results in a greatly reduced wing giving high drag which appreciably slows the aircraft's acceleration and that the wingplan is vulnerable to the pilot as a low frequency buffet. The results reason from its own stalled position of the nose is pushed well down.

Appendix "A" shows a diagrammatic representation of the various attitudes of its aircraft in the correct position of attack (i.e. 45-51° nose up). Also Appendix "B" shows that for the tail to begin to knock the ground at an angle of at least 31° is required.

CONCLUSIONS

1. Aircraft's characteristics were as noted.
2. The crew were properly located.
3. The ideal weight and the position of the CG were within the prescribed limits.
4. The payload during the crew were correctly done.
5. There was no failure or malfunctioning of the release or of its engine.
6. The aircraft's normal acceleration did not build up due to the program were no attitude of the aircraft which was permitted to develop and which resulted in high drag and a stalled condition.

OPINION

The accident was due to an error of judgment by the Captain in not recognizing the recovery from an attitude of the aircraft during the takeoff.

COMPLIANCE WITH REGULATIONS

In conducting this investigation the provision of paragraph (b) of Regulation 2 of the Civil Aviation (Investigation of Air Accidents) Regulations, 1951 (Statutory Instrument No. 115) of 1951 has been complied with.

VERNON BROWN

An Commissioner
 Chief Inspector of Accidents,
 Accidents Investigation Branch,
 Ministry of Civil Aviation



FUEL FOR SAVAGE

A North American AJ-1F Savage photo plane has its nose cone vibration tested with the magazine pilot in flight tests to test the system's heating and vibration characteristics. Assemblies is displayed in hanging the lower section of the nose. The AJ-1F, a reconnaissance version of the AJ-1, is in production at Columbus, Ohio.

AIRGINCORING ADVANTAGES:

- Maximum free durability
- Allow free, open-airing design
- Easy to clean—no dirt carrying creases or corners
- Aids splash-out
- Spring loaded pop-up door when remains closed in pressure relief applications
- Cleanest the existing exhaust production cost

WEBER AIRCRAFT CORPORATION
 2320 Outcrop Street • Burbank, Calif. • CWA-2343

Na more wash basin worries

PROFIT 77 required a rugged wash basin that could take the punishment of airline use. Light metal basins required too much maintenance. The problem was to create a "hardy" stainless steel basin that could be produced economically in a variety of configurations for various airlines and still retain a low weight factor. Cost considerations prohibited a separate production line for each airline.

WEBER AIRGINCORING WENT TO WORK. The result—a attractive, basic basin which is practically an obstacle free. Equally important, durability was achieved without paying a heavy production premium. Weber engineers designed universal dies and adaptors which accommodate a variety of airline designs. It's another example of how Weber Airgincoring works from design to delivery.



How to keep informed on the "with what" part of your business

At your **FIFTEEN** tips, since after none, is one of your richest veins of job information — advertising. You might call it the "with what" type — which dovetails the "how" of the editorial pages. Easy to read, talking your language, geared specifically to the betterment of your business, this is the kind of practical data which may well help you do a job quicker, better — move your company money.

Each advertiser is obviously doing his level best to give you helpful information. By showing, through the advertising pages, how his product or service can benefit you and your company, he is taking his most efficient way toward a sale.

Add up all the advertisers and you've got a gold mine of current, on-the-job information. Yours for the reading are a wealth of data and facts on the very latest in products, services, tools . . . product developments, materials, processes, methods.

Yes, too, have a big stake in the advertising pages. Read them regularly, carefully to keep job-informed on the "with what" part of your business.



McGraw-Hill PUBLICATIONS

Air Industry Briefed on ARDC Requirements

Pictured below are some of the 300 civilian industry, scientific and research guests invited by Air Research & Development Command to a special two-day briefing recently at Beltsville, Md., on present and future plans, weapons and equipment needs of the Air Force. Only security cleared personnel were permitted to take part in the discussions and presentations by USAF officials.



PLANES Olive Ann Berch, head of Berch Aircraft Corp., flanked by Lt. Gen. Farnbridge (left) and Maj. Gen. Donald L. Felt.



ENGINES J. L. Karsanick, Marquardt Aircraft Co. (second from left), talks to Lt. General Crest E. Cook, Jr., W. W. G. Continental Motors Corp., Lt. Gen. Chugan and D. L. Walker of Marquardt before us.



ARMAMENT Maj. Gen. R. F. Morking (right) with Lt. S. Thibodeau of Sun-Tan & Co. (center), and Paul S. F. Cooke, Case Institute.



TOP BRASS From left to right: Lt. Gen. Farnbridge, Lt. Gen. Cook, Maj. Gen. C. S. Britton, Lt. Gen. Leslie R. Groves (left), Lt. Gen. James H. Doolittle (left) and Lt. Gen. Chugan.



AVIONICS Col. D. G. Howard, Jr. (center) with J. M. Dyer (left) and John D. Whitmore, both of Airborne Instruments Laboratories.



PLANES & PARTS Gen. Joseph E. McNamara (left), General (second left), talks with C. L. Busch, Research & Launch, and S. E. Taylor, Polar Appliances. Right: Gen. Morking before us.

Patterson Takes Aircoach Fight to Public

- United president demands congressional hearing on his charges that CAB high-density policy is "unsafe."
- American and nonstop Air America ask permission to fly coach service on UAL transcontinental routes.

United Air Lines president W. A. Patterson last week carried his case against United to the public and Congress, leading to a series of high-density seating policy of Civil Aeronautics Board and other major airlines. Meanwhile, American Airlines was in the United-CAB fight a chance to move in as UAL's rival.

American asked CAB for immediate permission to bring "low-cost coach service" to United's transcontinental routes. A nonstop service, Air America, made a similar request on grounds that "United has failed to provide the service which the public demands or to United's market."

These petitions threaten intensified competition on United's transcontinental routes. They also give CAB a stronger position with which to regulate safe. Patterson could indicate his intent to drop the publicity phase of his campaign, which is alienating the rest of the industry through its adverse effect upon public confidence in the coach market.

► **Developments.** The other airlines deplore the CAB decision on how many seats a coach will install on its planes. As the Air Transport Association, United Airlines, Western Airlines, and others have the current United attitude. Next developments may include:

- CAB hearings as to why United's coach rule should not be suspended.
- Continued hearings to determine if high-density coach seating is safe, and whether CAB has power to compel specific seating densities.
- Federal court case on appeal of United's stay of CAB enforcement action, or an appeal of CAB to enforce the CAB regulation.

These pro and con outbreaks cause a shock to the industry, which only the week before had hoped Patterson's announcement of intention to adhere to DC-6 coach would avoid further open controversy on coach safety.

Patterson's move against high-density seating has stirred the other airlines and Civil Aeronautics Board. Fullpage ads in leading newspapers combined with weekly publicity about

a simple airline slogan, high-density aircraft is unsafe, could jeopardize much of the goodwill and trust the rest of the airlines have built up for their growing coach business. United and CAB understand the stakes.

► **United Fks Denied-CAB denied** United's request that the Board let it offer coach fares on medium-density (54-seat) DC-4s, citing:

- Under competition.
- Unreasonable to change low fares for an essentially first-class service.
- Sold CAB.

"We require seating 10 seats less than the airlines operated as its fleet on coach flights, United is able to offer coach service superior to that offered by other carriers who observe their own rule. The competitive advantage is clear. The competitive advantage is clear. The competitive advantage is clear."

As to comments of the Patterson press, CAB and that by cutting his period, Patterson made it unreasonable for him to extend coach service to as many people as cities as he, the other airlines and the Board planned.

► **Patterson Retaliates.** In a public statement, Patterson said that after Board decision, Patterson suggested a congressional investigation of CAB policy, stating that "inasmuch as a question of public safety seems to be at issue, it would seem appropriate for a study... by some independent group such as a congressional committee."

Patterson added that the company would make no further comment "until it has an opportunity to further analyze the United record by the Board."

United spokesmen admitted that the company, by continuing low-density coach operation, was in technical violation of its rule. But the surface air transport act would seem appropriate for a study... by some independent group such as a congressional committee."

On the same day, Jan. 3, Patterson announced what appeared to be the ultimate solution: to let whole difference between United and CAB—policy to switch from DC-4 coach to DC-6 coach. The industry reacted jealously. A top Air Transport Association official told Aviation Week that this looked like the way out for all concerned.

But the explanation was generous. ► **United's Adm-Patterson** contacted with full-page ads in leading newspapers under the title "The Fairness of a Mixed Operation to the Public as a United Method of Competition."

"The act contained CAB for its policy of forcing coach 'to make air service available to a greater number of people. It contains a sound sense of responsibility to the public. We agree about 12% of our mileage is coach-class service and have a process under way to increase this to 27% in the near future."

Next, Patterson says that his safety campaign suggested that United's 66-seat DC-4 might not provide "adequate protection" for emergency evacuation. Thus, he claims, the National Fire Protection Association and the Flight Safety Foundation confirmed "our previous conclusion." (Flight Safety Foundation denies this.)

The United chief executive then said, "We immediately reduced the DC-4 maximum load from 66 passengers to 54 and ordered the removal of the center seats to provide wider aisles."

The decision, Patterson says, "is based on the recommendations of other safety departments and supported by our management and the safety chairman of our joint committee representing the fellow United staff members of the Air Transport Association."

But Patterson added that the pilots' statement told Aviation Week that the pilots' stated pressing for more seats in United DC-4s after a fatal crash in La Guardia in 1949, before coach. But CAB, the spokesmen, disagreed with United's decision on both safety and economics, and disapproved Patterson's request for special permission to fly with less than the CAB maximum coach passenger density.

Patterson concluded, "What the outcome of this controversy will be we do not know. But we think we do know. We have an obligation, which we feel deeply, to serve our patrons with safety that is comparable. As we are concerned, that comes ahead of everything else."

History of UAL's Coach Policy

Nov. 4, 1946. Capital Airlines starts first scheduled domestic coach. Previously only coach service available offered by lower airlines.

1949. All major airlines except United start coach service.

May 4, 1948. "Competitive consideration" caused United to transcontinental coach service on the Pacific Coast early in 1950. United president Patterson says in his 1950 annual report dated May 3, 1951, adding "Such service was begun... with 56-passenger DC-4 planes."

Summer, 1951. CAB informally urged United to start transcontinental coach service. (American and United were serving this market two years.)

Sept. 29, 1951. United transcontinental 66-passenger DC-4 service to San Francisco.

Nov. 7, 1951. CAB, in closed-door conference with major airline chiefs, urged airlines to expand coach service and cut coach fares.

Dec. 5, 1951. United president Patterson announces transcontinental coach bus fares to lowest possible rate and states "Now it appears time to determine whether a low-cost airline can not learn to fly coach a mile in order to satisfy those who feel that we must broaden our market with a second-class service. We will watch the experiment closely and certainly will either double or expand the lowest service, depending on economic results."

Dec. 6, 1951. CAB issues joint statement urging airlines to expand coach service and cut fares. The statement discussed with the airlines informally the week before. Effect on transcontinental seating densities (including 64-seat DC-4 and 66-seat DC-6) for the next service, to provide profitability for the 44-seat coach—15% under airlines.

Nov. 7, 1952. Patterson, in annual report to stockholders, states "Low-cost scheduled coach service still may be considered experimental at this time. The extent of the coach market and the problem of diversion from standard fare services continue to be questions amenable only after a more extended period of scheduled operation. It also must be recognized that approach is premature that has taken place under standard traffic conditions imposed by the normal emergency and that as yet no data have been developed as a substitute of those which would allow wider seat normal conditions."

May 1, 1952. Trans Airline coach starts, with average flight increases of 50% attributed to coach seats in the airline's fleet.

September 1, 1952. Major transcontinental airlines start coach operation plans and perfect service will be the result.

1953. CAB continues to study coach service and perfect service will be the result.

become standard means of long-range travel.

Nov. 22, 1952. Patterson sends telegram and letter to CAB administrator asking that copies to CAB chairman's statement his cutoff of United coach from 66 to 54 seats. He says the additional passengers for existing coach and therefore seating could a slight loss in case of emergency evacuation in coach because of loading.

Nov. 22, 1952. Patterson sends telegram to some effect, and states selling more than 54 passenger tickets on his 66-seat DC-4, maintaining he will remove the center (54th) row of seats as soon as possible.

Nov. 28, 1952. CAB administrator writes Patterson that CAB/CAB administrator and its 66-seat DC-4 (operated by United, EAL, NAL, NWA, and others) are adequate seats.

Dec. 5, 1952. Patterson personally appears before CAB with airline presidents and other top executives at ATA annual meeting. They disagree with him.

Dec. 5, Patterson speech to Investment Bankers Association, annual convention states in part "We were forced into the coach because of that."

Dec. 8, 1952. Patterson personally appears before CAB administrator and CAB members. They continued that for general CAB coach seating regulations is safe.

Dec. 29. United petitions CAB for DC-6 coach service.

Dec. 6, 1951. CAB issues joint statement urging airlines to expand coach service and cut fares. The statement discussed with the airlines informally the week before. Effect on transcontinental seating densities (including 64-seat DC-4 and 66-seat DC-6) for the next service, to provide profitability for the 44-seat coach—15% under airlines.



DEBATES PAO OFF

Paul Brown (left), transcontinental coach with Continental Air Lines, Denver, and a champion aggressive coachman, receives a batch of air checks totaling \$100 from Patterson. 1. Ball, personal director, in many cases when passengers refuse to be carried. 2. Patterson (right) in 1952. Major transcontinental airlines start coach operation plans and perfect service will be the result.

competition, to operate 54-seat DC-4 coaches until it can convert to 58 seats (54) to meet under maximum set by CAB for coach fares on DC-4 service, by paying less than cost of a first-class coach and carrying a certain number of passengers.

Jan. 6, 1953. CAB denies United petition on grounds it is unseasonable and may be unfair competition. Board says United need Jan. 15 to accommodate UAL coach policy with that of CAB and rest of the industry. Board suggests Patterson use a 66-seat DC-6, which is big enough to meet both Patterson's own safety criteria and the Board's own coach rule.

Jan. 7. Immediate Patterson press release issues, stating that "United Air Lines plans to continue to operate its coach service with the latest seating capacity," and proposing a nonstop investigation of the coach safety issue.

Jan. 8. Air America, a nonstop coach, transcontinental coach, certificate a year ago, requests CAB exemption to fly coach service on routes and growth that "United's sudden failure to provide coach service is based in the years instance and public statements which United has, once a period of time, presented."

Jan. 8. Department of Transportation, United Air Lines now travel program CAB approved within 24 hr. of the case 54-seat coach.

Jan. 9. CAB denies the United traffic, in effect, has left United with technical violation of its coach rule, which requires a 66-seat configuration for DC-6 coach service.

Jan. 9. United announces plans to increase capacity from DC-4 to DC-6 coach service starting May 1 at about 70 passenger capacity, which is in accordance with CAB policy. This permit used to settle the dispute over coach, but the most requested is to whether Patterson would change his mind on what CAB considers forcing DC-4 seating between now and the time the last 54 or 66-seat United DC-4 coach is required to be a 54-seat DC-4 coach.

Jan. 10. Patterson places full-page ads in leading journals, explaining his decision to fight the CAB policy requiring high-density seating for low-cost flights. United has a "total obligation" to serve our patrons with safety that we consider separate," Patterson concludes in his ad.

Jan. 12. American Airlines openly backs CAB in its fight with United by announcing approval of Board by proposed to base aircraft service as "modern aircraft" in United's transcontinental routes from the East to Chicago in San Francisco and Oakland.

Jan. 14. Patterson sends to his press and also to the CAB a letter in which he says that 54-seat coaches instead of the CAB minimum of 64 seats.

C-46 Fire Safety, Power Updated

Operators of C-46 aircraft are awaiting results of final flight tests this month as a new engine nacelle cooling and fire-protection modification that may start the shockwave transport on its way to modern safety and payload performance.

American Aerospace, Mason, completed the installation last month and began flight tests in cooperation with the operator, Aerojet Engineering Foundation, Air Force, Civil Aerospace Research and Civil Aerospace Administration. Completion of the 30-in.

flight test program is scheduled for the end of the month.

Aerospace plans CAA certification tests under Part 25 of the Civil Air Regulations. The new installation is expected to meet fully the critical cooling requirements of cylinder head temperatures installed below 500° in a single-engine check at ME70 basic power.

► **Engine Power Boost**—If the tests go well, Aerospace plans to install a new CR-16 version of the Pratt & Whitney R2800 engine with 400 hp more than



NEW FIREWALL of stainless steel is designed to protect C-46 engine nacelles.

the present World War II version now operated in C-46s. Pratt & Whitney is shaping a mockup of the CR-16 to Aerospace, and plans to send two complete installations for flight test by July. Aerospace had the C-46 operators report the engine is giving the C-46 a higher payload than the present Cansoy and Martin, with equal safety.

Nathan H. Golden, American Aerospace's aircraft engineer and project officer on the C-46 program, estimates operators' cost of the individual parts of the program as follows:

- **Nacelle cooling and fire protection**, \$33,000 per plane. This includes moving cool flaps forward and increasing their area to increase cooling and protect the wheel well from the installing stainless steel firewall between the power and accessory section, and installation of three Edison die detector circuit-breakers for each area.

- **CR-16 Engines**. Cost is estimated at \$70,000 or \$15,000 per engine, including certification.

- **Modification of controls** to handle more powerful engines will cost nearly \$15,000 more per plane, Golden says. This includes storage bales and radials for the new engine instruments and a redesigned cockpit layout along the lines of the new Republic A-106 installation, following recommendations of the Society of Automotive Engineers' cockpit standardization unit.

- **Fire Protection**—The new cooling is designed not only to improve cooling but also to divert an engine fire out of the engine section. The firewall is expected to throw the fire outside the plane instead of allowing it to burn through into the accessory section. In the CR-16 (CR-16) a year ago, the bottom (No. 10) cylinder blew out, and fire burned through the cowling and up into the accessory section through the wheel well.

The nacelle modification, CR-16 en-



NEW C-46 NACELLE is inspected by C.A.B.'s Ryan, left, and chief pilot Gerert.

gine installation and flight test are financed jointly by Aerospace and the Aerojet Engineering Foundation. Founded by awarded C-46 operators to take over the normal function of the aircraft manufacturer in improving aircraft. This function was abdicated in the case of the C-46 when the Cansoy Wright Airplane Division went out of business.

CAB is encouraging these attempts of the C-46 operators to improve the safety and performance of the plane. Board Chairman Donald Ryan and member Joseph Adams have visited the Aerospace C-46 modification project in Mason. Robert Gerert, chief CAB pilot, planned last week to return to Mason to continue the participation in the flight test program.

- **Safety Check**—Improved safety and reliability are the chief aims of the program. As an emergency measure, CAB cut the allowable gross weight of C-46 passenger flights from 45,000 to 45,000 lb—a compromise figure higher than the original 42,500 proposed by the Board. The modification, now in flight test is expected to meet CAB safety criteria at the 45,000 lb gross weight.

The next step—CR-16 engine installation will take 300 more horsepower is expected to enable the operators to completely reconfigure the plane under modern transport category safety regulations. Golden predicts it will be certified at a gross weight of more than 45,000 lb and possibly more than 49,000.

Beyond the power will be equal to the Martin 4-4-4 or Corvair 140 and the engine is greater. Golden reasons that the C-46's wheel material also will be greater. "It will become a modern airplane," he says.

- **Modernization Cost**—The only problem is how operators will pay the estimated \$115,000 price for the en-



SILICONE FIBERGLASS DUCTING

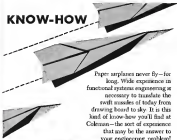
PERFORMS AT -125°F. Arrowhead Silicone Ducting withstands extreme temperature stresses. Offers greater possibilities of design in applications where flexibility and survivability are required. Arrowhead 82114 provides greatly increased longevity, maintenance, exceptional leak-proof qualities and better design. Ducting making possible more complex shapes.



ARROWHEAD
SILICONE DUCTING
SILICONE DUCTING
SILICONE DUCTING
SILICONE DUCTING

WRITE FOR
CATALOG
SILICONE
DUCTING
SILICONE DUCTING
SILICONE DUCTING

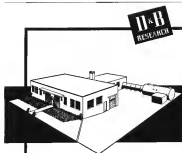
KNOW-HOW



Paper airplanes never fly—for long. Much experience in functional systems engineering is necessary to translate the swift missiles of today from drawing board to sky. It is this kind of know-how you'll find at Coleman—the sort of experience that may be the answer to your engineering problem!



6240 W. JEFFERSON BLVD., LOS ANGELES 16, CALIFORNIA



Facilities Features

- For Research
- Engine Cooling Testing
- Package Power Plants
- Power Plant Cooling Development
- Propeller Spinner and Blade Call Research
- Stress and Dynamic Balancing
- Propeller Spacers Repairs, Overhaul and Maintenance

Dean & Benson Research, Inc.

10 Richmond St.

Clifton, N. J.

Allyway 432/00

Kansas City Office 1811 Agnes Ave. Kansas City 1, Mo.

FORMER EASTERN AIRLINES DOUGLAS DC-3'S AVAILABLE FOR LEASE

We have available for immediate lease to corporations and airlines DC-3 Passenger and Cargo Airplanes. These aircraft are fully equipped for scheduled airline operation. Executive version also available. Call us for more information on the advantages of leasing. We can give you all the advantages of ownership without large capital expenditure. Let us show you the advantages of our corporate leasing plan. Our 33 years of aviation knowledge is at your disposal. Airplanes available for inspection at our Fort Wayne or Miami, Fla. base. Available with Wright or P & W engines.

BRANCH
Miami, Fla.
1104 Cal of Ind.
EXECUTIVE AIR INC.
1000 SOUTH MIAMI AVENUE
MIAMI, FLORIDA 33130
Call Ray B. Weaver, National Sales Director

MIAMI
Phone
9-1210

INSTRUMENTS

Authorized Factory Sales
and Service

For
* Eclipse-Pioneer
* Kollsman
* U. S. Gauge

C.A.A. Approved Repair Station
#3344

Contractors to U. S. Air Force
Our stock of instruments is one of the
largest in the East

IMMEDIATE DELIVERY

CALL • WIRE • WRITE

INSTRUMENT ASSOCIATES

Teletype: Great Neck 5-1157
901 Great Neck Road, Great Neck, N. Y.
Teletype: WEL Great Neck, N. Y.

LOCKHEED LODESTAR

Leto Serial #2614, A-633

This was one of the last Lockheed aircraft built by Lockheed and is waiting outside one of the very best you could find. Inspection and inspection is no show. Inspected condition inferior. Actual handling and flight is excellent. It is a real, not just, limited edition. It is described very well with the best and great the most you could find or want. 1000

PAGE AIRWAYS, INC.
Exclusive Agent - Burlington, New York
Bureau 7381

FOR SALE

2 DOUGLAS DC-4E's

1800 HOUR ON ENGINES
AND AIRFRAME

Wings, Passengers in single stream
We are offering complete responsibility of
owner of the following aircraft for sale:
DC 4E's 104100
104101
104102
104103
104104
104105
104106
104107
104108
104109
104110
104111
104112
104113
104114
104115
104116
104117
104118
104119
104120
104121
104122
104123
104124
104125
104126
104127
104128
104129
104130
104131
104132
104133
104134
104135
104136
104137
104138
104139
104140
104141
104142
104143
104144
104145
104146
104147
104148
104149
104150
104151
104152
104153
104154
104155
104156
104157
104158
104159
104160
104161
104162
104163
104164
104165
104166
104167
104168
104169
104170
104171
104172
104173
104174
104175
104176
104177
104178
104179
104180
104181
104182
104183
104184
104185
104186
104187
104188
104189
104190
104191
104192
104193
104194
104195
104196
104197
104198
104199
104200
104201
104202
104203
104204
104205
104206
104207
104208
104209
104210
104211
104212
104213
104214
104215
104216
104217
104218
104219
104220
104221
104222
104223
104224
104225
104226
104227
104228
104229
104230
104231
104232
104233
104234
104235
104236
104237
104238
104239
104240
104241
104242
104243
104244
104245
104246
104247
104248
104249
104250
104251
104252
104253
104254
104255
104256
104257
104258
104259
104260
104261
104262
104263
104264
104265
104266
104267
104268
104269
104270
104271
104272
104273
104274
104275
104276
104277
104278
104279
104280
104281
104282
104283
104284
104285
104286
104287
104288
104289
104290
104291
104292
104293
104294
104295
104296
104297
104298
104299
104300
104301
104302
104303
104304
104305
104306
104307
104308
104309
104310
104311
104312
104313
104314
104315
104316
104317
104318
104319
104320
104321
104322
104323
104324
104325
104326
104327
104328
104329
104330
104331
104332
104333
104334
104335
104336
104337
104338
104339
104340
104341
104342
104343
104344
104345
104346
104347
104348
104349
104350
104351
104352
104353
104354
104355
104356
104357
104358
104359
104360
104361
104362
104363
104364
104365
104366
104367
104368
104369
104370
104371
104372
104373
104374
104375
104376
104377
104378
104379
104380
104381
104382
104383
104384
104385
104386
104387
104388
104389
104390
104391
104392
104393
104394
104395
104396
104397
104398
104399
104400
104401
104402
104403
104404
104405
104406
104407
104408
104409
104410
104411
104412
104413
104414
104415
104416
104417
104418
104419
104420
104421
104422
104423
104424
104425
104426
104427
104428
104429
104430
104431
104432
104433
104434
104435
104436
104437
104438
104439
104440
104441
104442
104443
104444
104445
104446
104447
104448
104449
104450
104451
104452
104453
104454
104455
104456
104457
104458
104459
104460
104461
104462
104463
104464
104465
104466
104467
104468
104469
104470
104471
104472
104473
104474
104475
104476
104477
104478
104479
104480
104481
104482
104483
104484
104485
104486
104487
104488
104489
104490
104491
104492
104493
104494
104495
104496
104497
104498
104499
104500
104501
104502
104503
104504
104505
104506
104507
104508
104509
104510
104511
104512
104513
104514
104515
104516
104517
104518
104519
104520
104521
104522
104523
104524
104525
104526
104527
104528
104529
104530
104531
104532
104533
104534
104535
104536
104537
104538
104539
104540
104541
104542
104543
104544
104545
104546
104547
104548
104549
104550
104551
104552
104553
104554
104555
104556
104557
104558
104559
104560
104561
104562
104563
104564
104565
104566
104567
104568
104569
104570
104571
104572
104573
104574
104575
104576
104577
104578
104579
104580
104581
104582
104583
104584
104585
104586
104587
104588
104589
104590
104591
104592
104593
104594
104595
104596
104597
104598
104599
104600
104601
104602
104603
104604
104605
104606
104607
104608
104609
104610
104611
104612
104613
104614
104615
104616
104617
104618
104619
104620
104621
104622
104623
104624
104625
104626
104627
104628
104629
104630
104631
104632
104633
104634
104635
104636
104637
104638
104639
104640
104641
104642
104643
104644
104645
104646
104647
104648
104649
104650
104651
104652
104653
104654
104655
104656
104657
104658
104659
104660
104661
104662
104663
104664
104665
104666
104667
104668
104669
104670
104671
104672
104673
104674
104675
104676
104677
104678
104679
104680
104681
104682
104683
104684
104685
104686
104687
104688
104689
104690
104691
104692
104693
104694
104695
104696
104697
104698
104699
104700
104701
104702
104703
104704
104705
104706
104707
104708
104709
104710
104711
104712
104713
104714
104715
104716
104717
104718
104719
104720
104721
104722
104723
104724
104725
104726
104727
104728
104729
104730
104731
104732
104733
104734
104735
104736
104737
104738
104739
104740
104741
104742
104743
104744
104745
104746
104747
104748
104749
104750
104751
104752
104753
104754
104755
104756
104757
104758
104759
104760
104761
104762
104763
104764
104765
104766
104767
104768
104769
104770
104771
104772
104773
104774
104775
104776
104777
104778
104779
104780
104781
104782
104783
104784
104785
104786
104787
104788
104789
104790
104791
104792
104793
104794
104795
104796
104797
104798
104799
104800
104801
104802
104803
104804
104805
104806
104807
104808
104809
104810
104811
104812
104813
104814
104815
104816
104817
104818
104819
104820
104821
104822
104823
104824
104825
104826
104827
104828
104829
104830
104831
104832
104833
104834
104835
104836
104837
104838
104839
104840
104841
104842
104843
104844
104845
104846
104847
104848
104849
104850
104851
104852
104853
104854
104855
104856
104857
104858
104859
104860
104861
104862
104863
104864
104865
104866
104867
104868
104869
104870
104871
104872
104873
104874
104875
104876
104877
104878
104879
104880
104881
104882
104883
104884
104885
104886
104887
104888
104889
104890
104891
104892
104893
104894
104895
104896
104897
104898
104899
104900
104901
104902
104903
104904
104905
104906
104907
104908
104909
104910
104911
104912
104913
104914
104915
104916
104917
104918
104919
104920
104921
104922
104923
104924
104925
104926
104927
104928
104929
104930
104931
104932
104933
104934
104935
104936
104937
104938
104939
104940
104941
104942
104943
104944
104945
104946
104947
104948
104949
104950
104951
104952
104953
104954
104955
104956
104957
104958
104959
104960
104961
104962
104963
104964
104965
104966
104967
104968
104969
104970
104971
104972
104973
104974
104975
104976
104977
104978
104979
104980
104981
104982
104983
104984
104985
104986
104987
104988
104989
104990
104991
104992
104993
104994
104995
104996
104997
104998
104999
105000

Complete listing of equipment,
EXCLUSIVE SELLER'S AGENT
Only address: AIRCRAFTS-INT
Phone: 704-333-3333

ACA
Aircraft Corporation of America

Executive Office
34 Central Park South, New York 17, N.Y.

BERCHRAFTS
We specialize in the sale and lease of
Berchrafts and all the other aircraft
available to the general public.

— BERCHRAFT DISTRIBUTION —
ATLANTIC AIRCRAFT CORPORATION
P. O. Box 100, Cambridge, Mass. 02142

DC-3A — NO 733A

21 passenger airline interior
Excellent condition throughout
No longer January 1952
All work is in progress

NEW 1030-12 engine — TT 1257
and 1040 — TSO 240 and 251
AIRFRAME TT 1418 — TSO 250
Available for inspection in New York City

PRICE \$75,000
FREDERICK SILVER
118 E. 42nd St., New York 17, N. Y.
Tel. LEXINGTON 3-3445

SPOTWELDERS INC.

CONSULTING AND REPAIRING
COPPER SOLDERING MACHINES
CUT SPECIALTY ALUMINUM

1021 Westchester Rd., Jamaica 6, N. Y.

WATER FIELD WHEEL INC. 1000 10th
AVENUE, NEW YORK 17, N. Y.

AIRCRAFT PARTS & SERVICE 2002 10th
AVENUE, NEW YORK 17, N. Y.

For sale in New York City
1000 10th Avenue, New York 17, N. Y.

1000 10th Avenue, New York 17, N. Y.

1000 10th Avenue, New York 17, N. Y.

1000 10th Avenue, New York 17, N. Y.

1000 10th Avenue, New York 17, N. Y.

1000 10th Avenue, New York 17, N. Y.

1000 10th Avenue, New York 17, N. Y.

1000 10th Avenue, New York 17, N. Y.

WHAT DO YOU NEED?

Buy from one of America's largest stocks of
UNUSED AIRCRAFT PARTS

1500 COMPLETE UNITS OXYGEN BREATHING EQUIPMENT

For high altitude flying — new oxygen
complete, only in use. Manufactured by
U. S. Navy. Available for inspection.
Prized as a feature of original cost.

750 OXYGEN and CO. CYLINDERS

Various Sizes — Dealer Stock
High pressure — 4000 psi

AIRCRAFT ENGINES

WEIGHT

Quantity

1 1000-100 Low test time since new

10 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

1 1000-100 Low test time since new

CAL's Air Rights Pay Off

Those airline executives alert enough to peer ahead and apply the lessons of today to the problem of tomorrow seem to be the chief discoverers of new veins in commercial air transportation.

Too often the spotlight of publicity and appreciation glows on the big companies, to the exclusion of important developments being made elsewhere in the industry.

There is Continental Air Lines, for example. There was a time when President Robert S. Coen's compact network, as the Midwest craned above Wall St. heads to shake demand as the business contemplated the sparse population of these rural states, and wondered about Continental's long-term growth possibilities.

But Mr. Coen kept a close watch on developments in U. S. air transportation and he decided there was a shortcut to the alternative of working for Colombia, New Mexico, Kansas, Texas and the rest of his little empire to gain another 30 million population. And the shortcut wouldn't be at the expense of his present customers. It would give them better service than ever.

The shortcut was to negotiate an interchange with American Airlines, which Civil Aeronautics Board granted. Now you see Continental's Coen in flight. Los Angeles and American DC-6s on Continental strongholds such as San Antonio and Houston, offer strag on Continental schedules.

The hopes surprised financial barons of Lower Manhattan have stopped shaking their heads so vigorously, as they realize that the traveling populations of the Midwest Six Empire have been joined on CAL routes by millions of other travelers from more densely populated areas.

In one recent five period, Mr. Coen reveals, the profit from the one American Continental interchange route represented almost half of Continental's total profit.

When CAB approves a similar arrangement with United Air Lines for Seattle service, the imaginative Mr. Coen thinks his strategic position at the hub of the nation's airways will really begin paying off.

Furthermore, he is not overlooking the international possibilities of air exchange, and has already initiated overtures to American for operating his Convair 440s on a conventional line arrangement from Denver to Mexico City through El Paso and Monterrey.

Mr. Coen has not set at the wailing wall depicting his territory's sparse population and ever-rising costs of serving it. He has been ingenious enough to find a way to harvest more income by serving more people with better air transportation.

Mr. Coen doesn't fight progress, he makes it.



Robert S. Coen

'Nobody Takes Things Off'

I would . . . age all design engineers, and . . . all aircraft manufacturers, to be on the alert for the advent of single-bottoms.

It is amazing that there are many people who want to add things to airplanes than to take them off. Starting with the president and board of directors, and proceeding on down through the sales and public relations department, the operations department, the pilots, purveyors and cargo service divisions, the maintenance department, and the safety engineering department itself, there is a continuous development of good ideas, each suggesting the addition of more wheel complexity, unless sometimes his impudently necessary and their necessary changes.

No one apparently is devoted to taking things off. The ultimate effects on weight, economy and safety are evident. (From the Wright Brothers letter to 1912, to William LeBaron, vice president engineering, American Airlines)

Making the Most of Business Planes

Careful of utility aircraft operations has been the brightest spot in the private aviation picture since the end of the war. Millions of dollars are spent every year on executive and business planes, but we learn with surprise from Robert M. Howett that most owners achieve much less than maximum use and value from this vital fleet, now estimated at from 5,000 to 9,500 aircraft.

Mr. Howett, who has made a reputation in buying, selling, converting and servicing executive and business planes, has made suggestions to a score of plane owners that have improved markedly utilization of aircraft, and thus not only earned, hourly flying costs, and increased the value of these sales and business tools to their owners.

It probably is accurate to say that companies which have worked out efficient scheduling and usage of their planes are still in the minority. Only recently, for example, his General Motors Corp. centralized its flight services for the 20 added planes it has.

One reason for poor utilization, of course, is simple lack of thought and planning. There also is the philosophy held by the president or top executives or many plane-owning firms that the company plane is a tool, to be reserved for the exclusive use of the president or a very few other high officials, to be held ready—and thus idle—until "needed." Other firms permit use of their aircraft by more executives throughout their companies.

Mr. Howett believes that if the excess profits tax law is allowed to expire next June, companies owning aircraft will be glad they have obtained and kept high utilization of their planes, and will value detailed records of flight operations, and the purposes and profits from those trips. These firms, when tax time comes, will have the necessary information about their aircraft's activities in terms of time and money saved or profit made thereby.

Such companies, he says, will have no doubt about the dollar and cents value of their own aircraft, and neither will the Bureau of Internal Revenue.

—Robert H. Wood

Flying Tomorrow's Jets



SPERRY GYROSCOPE COMPANY
DIVISION OF THE SPERRY CORPORATION

CHARTER, NEW YORK • CLEVELAND • NEW ORLEANS • PHOENIX • LOS ANGELES • SAN FRANCISCO • SEATTLE
IN CANADA—SPERRY GYROSCOPE COMPANY OF CANADA, LIMITED, MONTREAL, QUEBEC

Sperry research engineers are seeking solutions for tomorrow's flight control problems, while they develop new ways to better the performance of control equipment currently flying.

This analog computer is duplicating flight conditions of a new high-performance jet bomber being flown automatically by the Gyroscopic flight control. Here, for instance, a Sperry engineer checks the performance of the airplane and automatic pilot during the bombing run.

In test after test—in laboratory and in great Flight Research Center, MacAuliffe Field, Long Island—Sperry flight controls are continuing to prove their capacity to maintain stable all-weather flight in jet, propeller-driven rotary-wing, lighter-than-air and glider aircraft.

For 40 years Sperry has been working continually on flight control problems. With the wealth of experience to build on, tomorrow's problems are being met by today's research and engineering.

self-locking fasteners

Elastic Stop nuts



HEX NUT



SPLINE NUT



HIGH TENSILE NUT



CLINCH NUT



1200° F. HIGH-TEMP. NUT



GANG CHANNEL NUTS



FLOATING ANCHOR NUT

Every major aircraft now being assembled relies on the vibration-proof holding power of ELASTIC STOP NUTS. Only ESNA manufactures a complete line of all types and sizes of self-locking nuts.



**ELASTIC STOP NUT CORPORATION
OF AMERICA**

Rollpins



dia. from 1/16" to 1/2"

Rollpins are slotted, tubular steel, pressed-fit pins with chamfered ends. They drive easily into holes drilled to normal tolerances, compressing as driven. Extra assembly steps like hole reaming or peening are eliminated. Rollpins *lock* in place, yet are readily removed with a punch and may be reused.

Cut assembly costs by using Rollpins as set screws, positioning dowels, clevis or hinge pins. Specify them in place of straight, serrated, tapered or cotter type pins.



*Mail Coupon
for Design
information*

Elastic Stop Nut Corporation of America
Dept. N34-152, 2330 Vauxhall Road, Union, N. J.

Please send me the following free fastening information:

- ☐ Elastic Stop Nut Bulletin
☐ Rollpin Bulletin
☐ AN-ESNA Conversion Chart

- ☐ Here is a drawing of our product. What fastener would you suggest?

Name _____ Title _____

Firm _____

Street _____

City _____ Zone _____ State _____